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NORTHERN WATERFRONT STUDY

WORKING PAPER NO. 1

December, 1966

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This report is a compilation of the basic data and analysis pertaining to current conditions in the Northern Waterfront area of San Francisco. As such, it provides the technical background information which will be a major input used to determine future goals and to prepare forecasts and plans for the Northern Waterfront.

The Northern Waterfront Study is the result of a joint City and Port effort to prepare a plan for the future development of both City and Port lands. Two consultants are under contract with the City to assist the Department of City Planning: Arthur D. Little, Inc., the economic consultant, has prepared an analysis of anticipated relative market demands for various classes of land-use activity; John S. Bolles Associates, the planning and design consultant, is under contract to prepare a development plan and implementation guides for the Northern Waterfront, including both City and Port areas. Arthur D. Little, Inc., is also under contract to the City to review and comment upon the feasibility of alternative plans which will be prepared by the planning and design consultant. In addition, Arthur D. Little, Inc., has completed a study of Port operations and economic considerations for the San Francisco Port Authority.

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The following maps, most of which have been prepared at a scale of 1 inch equals 300 feet, supplement the information included in this report:

1. Peak Hour Traffic Volume as a Percent of Street Capacity.
2. Truck Traffic as a Percent of Total Traffic.
3. Off-Street Parking.
4. Transit Lines and Terminals.
5. Rail Facilities and Usage.
6. Major Water Mains.
7. Sewage Treatment Plants and Service Areas.
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SECTION 1: FUNCTIONAL CHARACTERISTICS

HISTORICAL DEVELOPMENT OF ACTIVITIES IN THE NORTHERN WATERFRONT

A clearer understanding of existing development in the Northern Waterfront can be gained through consideration of historical development forces which have shaped the present pattern. In its study of Port operations, Arthur D. Little, Inc. stated that all development tends to follow a cycle of growth, decay, and new growth; the main forces which influence such cycles are formed by changing relative demands for alternative locations in an urban area. These changes in demand are caused by alterations in the structure of the local economy, technical innovations, shifts in population size, composition and characteristics, changes in consumer tastes, and developments in competing and complementary areas. In the Port study, Arthur D. Little, Inc. refers to this entire process as the "development cycle"; the following discussion presents their description of how the development cycle has taken place in the Study Area.

THE DEVELOPMENT CYCLE IN THE NORTHERN WATERFRONT AREA

Initially, the peninsular city of San Francisco provided the sites in the Northern Waterfront with a large economic advantage. It was the maritime center for the products of other regions and countries which were brought into the booming hub of Northern California: merchandise from China, manufactured goods from the Eastern states, lumber from the Pacific Northwest and produce from South America, all of which found their way into the rich California market through the Port of San Francisco. At the same time, gold and grain were shipped out of San Francisco to numerous consuming centers.

Throughout this era of intense maritime activity, a variety of uses developed which were uniquely suited to the area--various commercial and industrial uses closely related to ocean-borne trade. The demand for this space resulted in the development of the area in maritime-related activities and the complementary activities which served them. This development reached its peak in the 1920's; changes in patterns of trade, the depression, and the strikes of the 1930's subsequently retarted maritime-oriented activity in the area.

Such maritime-oriented activities reached their peak in 1929; thereafter the Port activity began to be less crucial to inland, intercoastal and coastwise shipping, although its foreign trade continued to grow. Needless to say, the total activity of the area in all trade was gradually retarded by the depression and strikes of the 1930's.

In the period commencing in the early 1900's, however, rail connections had developed to serve the Port and the adjacent industrial and commercial activities that grew up in the area. Thus it became an increasingly-ideal site

for warehousing and industrial concerns which required both water and rail linkages. Many of these industries prospered partially because they were located at a transportation hub that permitted them to ship and receive goods to and from a vast hinterland.

At this stage the value of the land and structures in the area increased; the profitable businesses paid relatively high rents or prices to remain in the area. As specialized modern facilities were constructed, the stock of available land diminished.

Unfortunately, this development into intensive use set the stage for the future rigidities which finally caused a decline in the area. Most of the desirable land came to be utilized by specialized activities with heavy capital investments; this condition discouraged construction by newer businesses with other functions which tended to locate in places where only costs for land purchase were involved.

At the same time, since the available land was covered, the area could not respond quickly to changing technology, particularly the diminished importance of rail linkages for many of the warehousing and manufacturing activities that were in the area. As the truck began to be an increasingly important mode of transport, uncongested loading and highway access became more important than the existing rail lines. Furthermore, many of the existing multistoried warehouse and commercial facilities that had been built in the area were less efficient to operate than the modern horizontal plants. Thus, time and obsolescence took their toll and slow deterioration began as land values declined, vacancy rates increased, and the area began to experience a general decline in activity.

Concurrent with this decline, however, the Port Authority fortuitously encouraged the conversion of some unproductive land to new, market-oriented uses. The growth of the Fisherman's Wharf area, with its restaurants and shops, had preceded the development of a new market in the region--serving affluent consumers who enjoy eating and shopping in an authentic maritime environment.

The increasing demand for restaurants and stores did not remain unnoticed. The low values of the surrounding land encouraged successful investors to purchase property and convert it to the new profitable uses. The success of such efforts has spawned numerous imitators and has increased the value of some locations to the point that old buildings can be profitably torn down and replaced. A new upward cycle of development, initiated by the original development of Fisherman's Wharf, is now in progress.

Along with successful new investors, some of the remaining owners have seen the obvious attraction which the area has for tourists and local consumers. They have recognized that new facilities can be constructed on the existing land and operated more efficiently. Other firms have converted some of their activities to capture a portion of this consumer and tourist-oriented market, the most obvious example being the volume selling of retail imported

goods in existing structures. Businesses that can mesh waterfront authenticity with consumer sales have prospered and find it advantageous to remain in the area in spite of the congestion and mix of activities.

Thus, the infusion of new uses and the conversion from old uses have diversified the residual maritime environment. This has resulted in the existence of several major use categories in the upward cycle of development:

1. Maritime facilities built, maintained, and operated by the Port of San Francisco.

2. Some older manufacturing and warehousing facilities which do not move to more efficient locations because of heavy capital investment, and for which sufficient demand still exists to allow them to remain in the area.

3. Original facilities occupied by businesses that have been able to mesh water-oriented activity with a changing environment and now remain in the area as the demand for their services increases.

4. New and remodeled facilities used by businesses serving the consuming public; these firms are dynamically expanding as the area becomes an increasingly strong magnet for affluent consumers who find this area with its mixture of sea and land activities uniquely appealing.

5. Commercial and administrative offices attracted to the area for two reasons: first, the low cost of renting space in older facilities and second, the amenity for many professional and business men of the active and still authentic waterfront atmosphere.

1966 BASE DATA

MAJOR PUBLIC AND PRIVATE FACILITIES

TRANSPORTATION

Transportation is a vital element in the Northern Waterfront because it serves as a functional linkage between land use activities in the Study Area and consumers and other land use activities (both within and outside of the area). The Northern Waterfront not only includes major points of transportation origin and destination, but routes within it also serve to carry large volumes of commuters to and from the Central Business District via the Golden Gate Bridge (using Bay Street and the Embarcadero) and the Bayshore Freeway. Furthermore, all modes of transportation are or will soon be operating within or through the Northern Waterfront--vehicular, rail, water, and air. The following discussion describes existing transportation facilities within the Study Area.

Freeways

Freeways in the study area, although entirely elevated, occupy about 24.5 acres of land within the Northern Waterfront, including about 5.5 acres of air rights over railroad tracks and yards and the Embarcadero. Much of the approximately 19 acres of open land beneath the elevated freeway is used for public parking.

The majority of land occupied by freeways is located in Planning Area III. The Broadway ramps and the Embarcadero Freeway itself occupy about 3.6 acres of air rights over the Embarcadero and railroad yards and about 1 acre of other lands (nearly all of which is currently used for public parking) in Planning Area II. No freeways are located in Planning Area I.

The Southern Freeway extension to a connection with the Embarcadero Freeway will require another approximately 20 acres of land in Planning Area III -- about 13 acres of land area and 7 acres of air rights over railroad yards and the Embarcadero.

An urban freeway can carry about 1500 vehicles per lane under free-flowing conditions at a design speed of 50 miles per hour; under conditions of much lower speed and some delay, it can carry about 2100 vehicles per lane. Thus the present evening peak hour traffic on the Embarcadero Freeway (outbound only) of about 1,775 total vehicles (all lanes) indicates that this freeway is presently operating at about 60 percent capacity for free-flowing conditions and at about 40 percent capacity for less free-flowing conditions. The Southern Freeway extension, when it is open to traffic, will provide an additional freeway capacity within Planning Area III of 4500-6000 vehicles per hour in one direction.

Arterial and Local Streets

The following tables indicate that arterial and local streets in the Northern Waterfront occupy 167 acres of land, two-thirds of which is City property and one-third is Port Authority property. Nearly one-half of this area is located in Planning Area III, and one-third in Planning Area I, while the remaining 20 percent is located in Planning Area II.

Of the 167 acres of street area in the Northern Waterfront, 4.2 acres are presently undeveloped. Nearly all of this undeveloped street area is found in Planning Areas I and II in the vicinity of Telegraph Hill.

Traffic volumes within the Study Area were obtained from the Department of Public Works and from recent field checks by the Department of City Planning to determine the percentage of truck traffic. The following table presents average daily traffic (ADT) volumes for the Study Area.

A comparison of street capacities and current traffic volumes indicates that a number of streets within the Study Area are severely congested during the peak hour (see the accompanying map, "Peak Hour Traffic Volume as a Percent of Street Capacity"). The most severely-congested streets include Bay Street, the Embarcadero, Berry Street, and Columbus Avenue. Streets adjacent to the Study Area which are congested include Sansome Street, Washington Street, and Clay Street.

The map entitled "Truck Traffic as a Percent of Total Traffic" indicates those streets on which truck traffic predominates. All such streets are located in Planning Area III south of Market Street, reflecting the high usage of trucking for the transport of goods in that area. Truck volumes vary widely on the Embarcadero, depending upon the schedules of shipping activities. However, during an average 24-hour period it is estimated that trucks comprise 25-50 percent of all vehicular traffic on the Embarcadero.

Public Parking Lots and Structures

It is estimated that about 3,330 spaces now exist in off-street public parking lots and structures within the Study Area. The majority of public parking structures and lots are located in Planning Area I (about 1,345 spaces) and Planning Area II (1,155 spaces); about 830 public parking spaces are located within Planning Area III. Approximately one-fourth of the total available spaces are located within parking structures, and three-fourths are located in open lots.

Transit Lines and Terminals

A number of separate public transit lines presently operate into the Northern Waterfront. The accompanying map describes the various transit routes and terminals within the Study Area.

Table 1

LAND AREA IN STREETS, NORTHERN WATERFRONT
(acres)

Street Type	Planning Area			Study Area
	I	II	III	
ity Streets	37.3	19.9	54.4	111.6
(developed)	(36.7)	(18.1)	(54.4)	(109.2)
(undeveloped)	(0.6)	(1.8)	(-)	(2.4)
ort Streets	16.7	14.6	24.0	55.3
(developed)	(15.2)	(14.6)	(23.7)	(53.5)
(undeveloped)	(1.5)	(-)	(0.3)	(1.8)
l Streets	54.0	34.5	78.4	166.9
(developed)	(51.9)	(32.7)	(78.1)	(162.7)
(undeveloped)	(2.1)	(1.8)	(0.3)	(4.2)

Source: John S. Bolles.

Table 2

LAND AREA IN STREETS, BY PERCENT

Street Type	Planning Area I	Planning Area II	Planning Area III	Study Area
ty Streets	22.6 %	12.0 %	32.2 %	66.8 %
(developed)	(22.5)	(10.9)	(32.2)	(65.6)
(undeveloped)	(0.1)	(1.1)	(-)	(1.2)
rt Streets	10.0 %	8.7 %	14.5 %	33.2 %
(developed)	(9.1)	(8.7)	(14.3)	(32.1)
(undeveloped)	(0.9)	(-)	(0.2)	(1.1)
l Streets	32.6 %	20.7 %	46.7 %	100.0 %
(developed)	(31.6)	(19.6)	(46.5)	(97.7)
(undeveloped)	(1.0)	(1.1)	(0.2)	(2.3)

Source: John S. Bolles.

Municipal Railway.

The San Francisco Municipal Railway operates the cable car system and regular buses in the Study Area. The two cable car routes terminate at Victorian Park and at Taylor and Bay Streets. The latter termination point creates two problems: (a) a heavy flow of pedestrians crosses Bay Street and conflicts with traffic, and (b) these pedestrians must walk three blocks to Fisherman's Wharf, their primary destination.

The Muni bus lines connect various parts of the Study Area at the present time, but in view of anticipated new developments in Planning Areas I and II, improved bus service between Fisherman's Wharf and the Ferry Building, as well as a realignment of routes within Planning Area II, may be necessary.

Two major Muni bus facilities are located in the Study Area. One is the bus turn-around in the center of the block bounded by Market and Mission Streets, Steuart Street and the Embarcadero. This site is part of the proposed Ferry Park, and when the park is developed the bus turn-around will be relocated to the south end of this same block and adjacent to the park. The second major facility is the Kirkland Yard which includes the entire city block at North Point and Stockton Streets, where buses are stored and minor maintenance performed. The location of this storage yard is not the most advantageous for bus operations because it is near the beginnings and ends of only a few bus routes; furthermore, the location is in an area in which new commercial developments are taking place and land values rising.

Marin County Commuter Buses.

The Greyhound Bus Company presently operates commuter buses to and from Marin County; during the morning and evening peak hours an area beneath the Embarcadero Freeway in front of the Ferry Building is used for a terminal. About 1700-1800 people use this terminal during each peak period. These buses travel through the Northern Waterfront via Lombard Avenue, Van Ness Avenue, North Point Street, Columbus Avenue, Bay Street, and the Embarcadero.

Tiburon Ferryboats.

At the present time ferryboat service connects Tiburon in Marin County to a terminal point directly north of the Ferry Building. One ferry run is made during each peak period, carrying about 150 people into or out of San Francisco.

Helicopter Service.

At this time no helicopter service is available in downtown San Francisco. However, the Port Authority has agreed to temporarily locate a heliport immediately north of the Ferry Building, and is investigating the feasibility of locating a permanent heliport in the vicinity of the Ferry Building. It is anticipated that the temporary heliport will be in operation very soon.

Rail Lines

The accompanying map describes rail lines and facilities within the Study Area and indicates the average monthly car loadings at major origins. An average of 1,363 car loadings per month are made in the Northern Waterfront--1,006 on Port piers and 357 on private property.

Average monthly car loadings are highest in Planning Area I (605 cars) and Planning Area III (426 cars), and lowest in Planning Area II (332 cars). Port operations comprise the major share (75 percent) of all rail car loadings; if pier operations are realigned and any piers removed from maritime activity, the pattern of rail usage in the Study Area would be greatly altered.

Two major rail facilities are located in the area -- a rail ferry dock at Pier 43, and a quarter-roundhouse at Lombard Street and the Embarcadero.

TABLE 4

AVERAGE MONTHLY RAIL CAR LOADINGS IN THE STUDY AREA

Planning Area	Car Loadings on Piers	Car Loadings on Private Property	Total Monthly Car Loadings
I	468	137	605
II	244	88	332
III	294	132	426
Study Area	1006	357	1363

It should be pointed out that although three other railroad companies (Southern Pacific, Santa Fe, and Western Pacific) use train tracks in the Study Area, all rail activity in the area is carried out by the State Belt Line Railroad.

UTILITIES

Water Supply System

Water mains in the Study Area are of two basic types:

1. Feeder mains, which carry the major portion of the water supply.

2. Service mains, which distribute water from the feeder mains to individual properties.

Water mains are even more ubiquitous over the area than are sewer lines, and are generally found along every street within the Study Area. Also, the sizes of water mains vary over a lesser range than sewers and are more

evenly distributed among various sizes than are sewers; that is, a hierarchical structure is more readily apparent in the sewerage system than in the water supply system.

Feeder mains vary from 1.5 to 30 inches in size. The accompanying map indicates only those primary mains which are 12 inches or larger. The secondary smaller mains are 6 and 8 inches in size, and are not shown on the map, nor are the many smaller mains 1.5 to 6 inches in size; the relocation problems presented by the smaller secondary mains would not be as large as those presented by mains 12 inches or larger.

Sewerage System

Sewers in the Study Area are of three basic types:

1. Large trunk and interceptor sewers, usually made of concrete or brick. (In one isolated case, a 2'-6" by 5' wooden sewer is still in operation over a length of about 200 feet). All of these important sewers which are located within and adjacent to the Study Area are shown on the accompanying map.

2. Feeder sewers, which are normally constructed of concrete or vitrified clay pipe. These sewers are fairly ubiquitous and are not shown on the accompanying map. In size, they are generally much smaller than trunk and interceptor sewers, and would thus pose much less of a problem if relocation were desirable.

3. Service sewers which connect individual properties to feeder and trunk sewers. These sewers are also not shown on the accompanying map. Their importance to this study is very slight, and would arise only in consideration if additional service sewer lengths were required to connect with trunk and feeder sewers which may be relocated.

A special case is found in the Study Area, in which a 10-inch sludge force main carries sludge from the North Point Treatment Plant through the Study Area and to the Southeast Plant for treatment. This sewer is a major one and deserves important consideration in planning for development in the Study Area.

Sewer Sizes.

As was indicated above, trunk and interceptor sewers are built of both concrete and brick (the brick ones tending to be the older of the two). Brick sewers tend to be fairly standardized in size -- most are either 2 feet by 3 feet or 3 feet by 5 feet. However, concrete sewers vary widely in size; the following sizes of concrete sewers are found at various locations within the Study Area:

2 x 3	feet				
2.5 x 3 75	"		5.5	feet	in diameter
3 x 4 5	"		7	"	" "
3.5 x 5 25	"		8	"	" "
4 x 6	"		8.5	"	" "
5 x 9	"				
6 x 7 5	"				

It is also interesting to note that in some cases along and near the Embarcadero concrete sewers are supported on piles; piling is probably needed to "hold down" the sewer against the buoyant force of a high ground water table (and to thus maintain a specific slope, an important element in the operation of a gravity flow system), and also to help support the sewer in wet soil conditions.

It is clear that these large sewers are of great importance, and relocation costs required by plan proposals must be explicitly recognized.

Sizes of feeder and service sewers are much smaller, generally less than 24 inches; feeder sewers are commonly between 12 and 18 inches, while service sewers are generally 8-10 inches or less. These smaller sewers will generally present fewer relocation problems and smaller costs of changes than will trunk and interceptor sewers.

North Point Sewage Treatment Plant

Because it is a major public facility, and also, because of its particular location at a narrow point between Telegraph Hill and the water's edge, the North Point Sewage Treatment Plant merits special attention.

The North Point plant is one of three sewage treatment plants serving San Francisco; the locations and general service areas of these plants are shown on the accompanying map. The North Point plant was constructed at a cost of $8,900,000, plus $1,000,000 for connecting sewers (for a total capital investment of about $10 million). The plant began operation in December, 1951.

The treatment system utilizes a basic process of sedimentation and chlorination. The attached chart indicates the general steps in the process from intake to discharge. The present plant utilizes primary treatment only; as such, the effluent discharged is basically bacteriologically pure, but only about 40 percent of solid material is removed.

Treatment standards are established by the State Department of Public Health. It is likely that these standards will be increased, and it is expected that the City will be required to increase its quality of treatment. This means that a secondary treatment process must sometime be added to the primary process now in effect at the North Point plant.

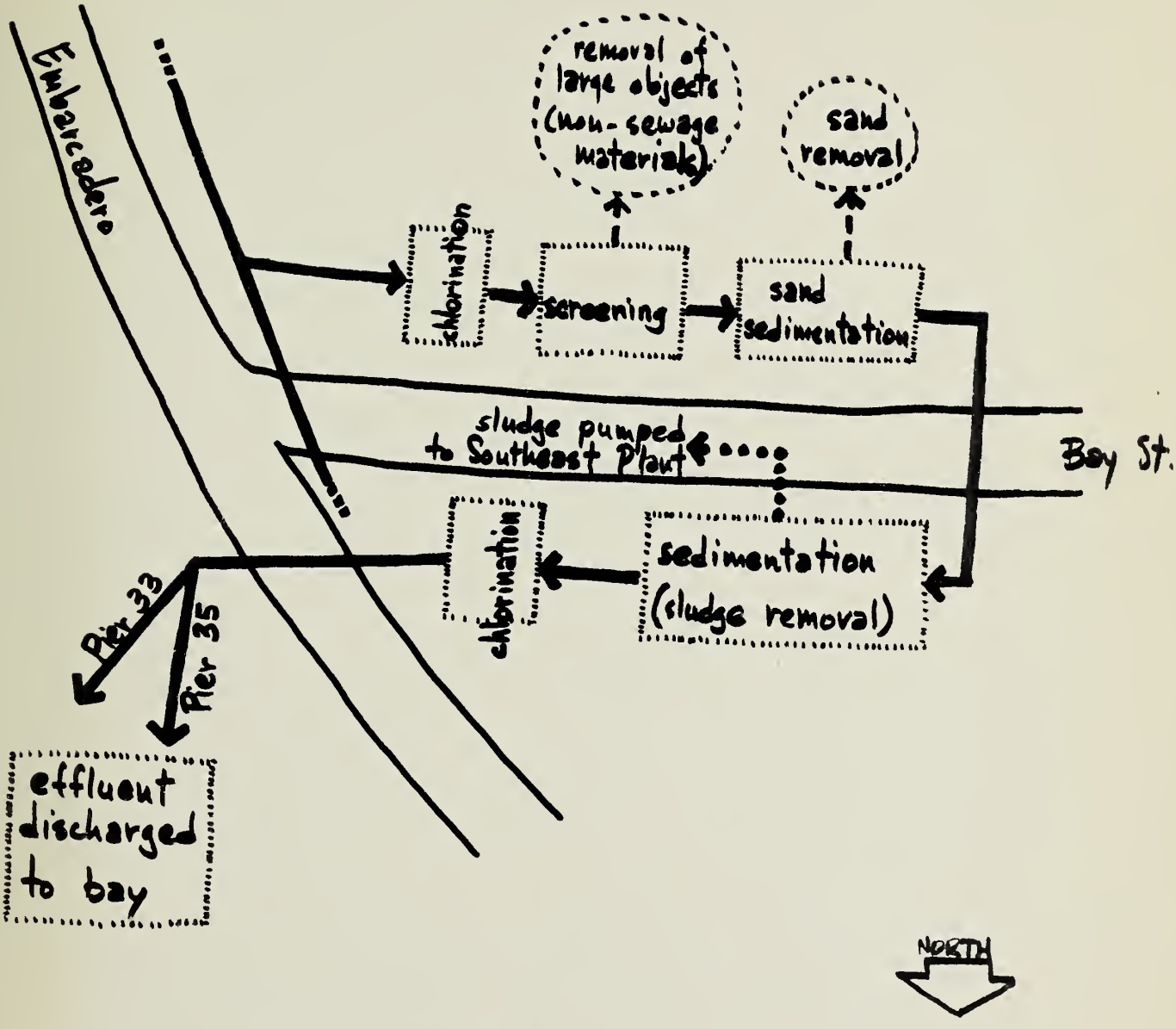


Figure 1

DIAGRAM OF SEWAGE TREATMENT PROCESS AT NORTH POINT TREATMENT PLANT

It is the general concensus of operating personnel that the existing plant would remain at its location (because of the large, fixed capital investment), but that three operational alternatives are available:

1. Pump all sewage from San Francisco to a large regional treatment facility located several miles offshore in the ocean.

2. Pump all primary-treated sewage from the existing plant to a secondary treatment facility somewhere else in the city (or possibly the ocean).

3. Build a secondary treatment facility adjacent to the present North Point plant. (Discharge could be either into the bay, as at present, or into the ocean some miles offshore).

It is believed that the first alternative would not occur within the 20-year planning period of this study. Alternative 2 would require expenditures for both a new facility for secondary treatment and a pumping station, while Alternative 3 would not require a pumping station. Thus, if cost is of prime consideration, Alternative 3 is most likely to be chosen.

If a secondary treatment facility were built at the present site, the required land (or space) would be, at a minimum, as large as the existing plant. If only a pumping station were required, as in Alternatives 1 and 2, the area required would be about as large as the present Administration Building (approximately 100 by 200 feet).

It has been roughly estimated that to replace the existing plant in another location in the early 1970's would cost from 2.5 to 3 times as much as the original capital cost, i.e., $25-30 million. Also, a new pumping station at the present site would be required. Furthermore, the new facility built at that cost would only provide primary treatment, and its capacity would not adequately meet the area's needs. Thus, to build a new adequate facility would probably cost about $50 million at a minimum. (Also, additional costs would be incurred in laying new sewer lines to connect the present site with a new site.)

The existing sewerage system is a combination type which carries both sewage and storm water run-off in the same pipes. Thus, in wet periods, the capacity of the system is inadequate, and excess storm water mixed with untreated sewage overflows into the bay through a number of outfalls. The accompanying map indicates the location of such outfalls along the Northern waterfront area. During the 20-year planning period it could be anticipated that some type of facility will be added to the outfalls to catch debris which normally flows out during wet weather conditions. This is a technological problem, and a number of cities, including San Francisco, have received demonstration grants to develop solutions to this problem. However, it is not expected that all overflow of storm water and sewage will be stopped.

The design capacity of the North Point treatment plant is 60-65 million gallons per day. (It was anticipated when the plant was built that this

capacity would be reached in 1970.) The system has a total treatment capacity of 150 MGD, i.e., during wet weather conditions when the total flow is only partially treated. At the present time, actual daily quantities treated throughout the week vary--on the average weekday, about 53 MGD are treated, whereas on weekends and holidays the quantity is from 45-49 MGD. The design capacity could be increased by 10-20 percent if a chemical coagulant is used to hasten the sedimentation process, thus decreasing the total treatment time per unit and therefore increasing the total amount of sewage that could be treated in an hour or a day.

The North Point Sewage Treatment Plant treats about 55 percent of the total daily city-wide load of about 90 million gallons; the Southeast and Golden Gate Park plants each treat about 20 MGD, while the North Point plant treats about 50 MGD. These relationships are obvious when it is realized that the North Point service area includes the Central Business District and close-in high-density residential areas.

Two specific potential problems exist in connection with the treatment plant and the storm water sewers. First, the storage of chlorine in above-ground tanks at the treatment plant does present potential dangers to public safety and health--the possibility of leaking pipes, valves, and meters does exist. Secondly, the storm water outfalls now discharge into the bay under existing piers and about 900-1000 feet off-shore. If new, non-Port development takes place on piers located over outfalls, the outfalls would have to be extended about 900-1000 feet from their present location.

PUBLIC BUILDINGS.

Aside from Port Authority buildings related to cargo handling, only a few public buildings are located in the Study Area, and all of them are located in Planning Areas I and III. The following public buildings are located in Planning Area I:

San Francisco Maritime Museum
North Point Treatment Plant
U.S. Coast Guard
Francisco Junior High School

These public buildings are located in Planning Area III:

Ferry Building
California Department of Agriculture
U.S. Post Office
U.S. Marine Corps Supply Depot
U.S. Government Warehouse
San Francisco Fire Department Station

PUBLIC OPEN SPACE AND RECREATIONAL FACILITIES.

Only a few public open spaces are located within the Northern waterfront. These include Aquatic Park and Victorian Park in Planning Area I and a portion of the Coit Tower open space in Planning Area II. The proposed Embarcadero Plaza will be developed in Planning Area III across the Embarcadero from the Ferry Building.

Also, three public recreational facilities are found within the Study Area, all in Planning Area I -- the Balclutha, the Maritime Museum building (which includes facilities for a senior citizens group as well as the museum itself), and the San Francisco Maritime State Historical Park at the Hyde Street Pier. Some semi-public rowing clubs are also located at Aquatic Park.

PRESENT DISTRIBUTION OF POPULATION, ECONOMIC CHARACTERISTICS, AND LAND USE, BY PLANNING AREA

POPULATION.

One of the important characteristics of the Northern Waterfront as it exists today is that very few people actually reside there (although large population concentrations are located adjacent to the Study Area); in fact, less than 3 percent of the land area in the Northern Waterfront is used for permanent residential purposes, while another approximately 3 percent is used for transient housing (hotels and motels). The following discussion indicates the number of people who live in the study area and where their residences are located.

Number of Residents

The Department of City Planning estimates that about 1,436 people reside permanently in the Northern Waterfront. Of this total, about 91 percent, or 1,300 people, live in Planning Area I in close proximity to Fisherman's Wharf and Telegraph Hill. A substantial increase in residential units has occurred in this area in recent years, mostly as a result of the construction of the Fontana Apartments and the three-story apartments at Bay and Stockton Streets. An estimated 600-650 people will be added to the population upon completion of the residential portion of the North Point development, also near Bay and Stockton Streets.

It is estimated that only about 49 people live in Planning Area II between Bay and Market Streets. Of these, about 45 live in the block bounded by Broadway, Pacific, Battery, and Front Streets.

About 87 people live in Planning Area III south of Market Street, and nearly all of these (75) live in the block bounded by First, Second, Folsom, and Harrison Streets which is zoned M-1 (light industrial). The C-3 study indicates that new residential uses in the South of Market area should not be considered likely or desirable; gradual removal of existing residential uses will occur, and in the case of those dwellings located in the M-1 District, a mandatory removal date of 1980 now exists in the City Planning Code.

Dwelling Units, By Type

Nearly all (97 percent) of the dwelling units in the study area are located in multi-family structures. As is the case with population, most dwelling units are located in Planning Area I near Fisherman's Wharf and Telegraph Hill -- 637 units are located in this area, of which 619 are in multi-family structures and 18 are single-family structures.

Nineteen dwelling units are located in Planning Area II; only one is in a single-family building, while 18 are in multi-family structures (all located in the block bounded by Broadway, Pacific, Battery, and Front Streets).

Thirty-four units are located in Planning Area III south of Market Street; only two are in single-family structures, while 32 are in multi-family buildings.

In the Study Area as a whole, therefore, only 21 of a total of 690 dwelling units are in single-family structures while 669 are located in multi-family buildings.

Transient Accommodations

Ten hotels and motels are located in the Northern Waterfront. Four of these are located in the Fisherman's Wharf area--two in the vicinity of Columbus Avenue and Bay Street, and two in the vicinity of Mason and Beach Streets. These four establishments contain 385 rooms and are of a first-class quality.

Six hotel establishments are located in Planning Area III south of Market Street, including the Y.M.C.A. and the Salvation Army Hotel which contain a total of more than 400 rooms. The other four hotels contain about 170 rooms, most of which are second-class accommodations.

ECONOMIC CHARACTERISTICS

This section describes the economic characteristics of the Northern Waterfront in terms of employment, personal income, retail sales, and tax revenues.

Employment

Because the San Francisco Port Authority is the largest single employer in the Northern Waterfront, it deserves important consideration in this discussion of employment in the Study Area. Arthur D. Little, Inc., in its study for the Port Authority entitled The Port of San Francisco: An In-Depth Study of Its Impact on the City, Its Economic Future, and the Potential of Its Northern Waterfront, summarizes its conclusions regarding Port employment with these statements:

> "To the presence of the San Francisco Port, and the cargo it handles, we can attribute 23,000 jobs and $195 million in payroll, with an average annual wage of $8,600, two thousand dollars above the city average. Through consumer spending, the Port's impact extends to an estimated 52,000 to 67,000 jobs and $390-490 million of income, representing 11 to 14 percent of the City's employment and a higher proportion of its payrolls."

The 23,000 jobs which are directly attributable to Port activity represent 4.7 percent of total employment in San Francisco, and 6.1 percent of the City's total wages and salaries.

TABLE 5

DWELLING UNITS, ESTIMATED POPULATION
ASSESSORS BLOCKS AND SUBAREAS

Sub-area	Block Number	No. of Dwelling Units			(a) Estim. No. of Persons
		Sing. Fam.	Multi. Fam.	Total	
I	451	-	263	263	530
	24	6	64	70	114
	25	2	49	51	140
	30	-	2	2	6
	39	3	73	76	130
	40	-	137	137	260
	41	7	31	38	120
Total		18	619	637	1,300
II	85	1	---	1	4
	166	-	18	18	45
Total		1	18	19	49
III	3749	2	28	30	75
	3765	-	2	2	6
	3774	-	2	2	6
Total		2	32	34	87
STUDY AREA TOTAL		21	669	690	1,436

(a) Sources used in estimates of the number of persons and average rentals were the 1960 Census and data provided by apartment building managers. The estimates include construction since 1960.

(b) Source, 1960 Census. Blocks reflect averages of Census Tracts, A-1, A-2 and K-1.

It is estimated that 15,600 persons are employed in non-Port activities in the Northern Waterfront. The majority (68 percent) of these employees work in Planning Area III south of Market Street, while 19 percent and 13 percent work in Planning Areas II and I, respectively.

Employment in Planning Area I is concentrated mainly in retail shops, restaurants and entertainment, motels and hotels, and professional offices, while employment in Planning Area II is characterized by printing, food processing, and warehousing activities. Employment in Planning Area III is concentrated in general administrative offices (which includes nearly one-third of all non-port employment in the Study Area) and such light industrial activities as printing, food processing, manufacturing, machine shops, warehousing, and marine services.

Current development projects now being constructed or planned will tend to further intensify the employment characteristics in Planning Area I, where retail, professional offices, and restaurant and entertainment activities are being developed, and in Planning Area III, where further development of general administrative offices are being developed. Anticipated development in Planning Area II, however, will likely change the employment character of this area from light industrial to retail and general commercial.

In summary, then, at the present time about 38,600 persons are employed in the Northern Waterfront -- 23,000 in Port activities and 15,600 in non-Port activities. The estimated total payroll obtained by all employees in the Study Area is $300 million -- $195 million for Port employees and approximately $105 million for non-Port employees. The total impact of this payroll, as "multiplied" through consumer spending, upon San Francisco is very significant, and amounts to approximately $600-740 million.

Personal Income

The discussion of employment in the Study Area indicated that total payrolls were estimated to be about $300 million. The personal income of residents within the Study Area is, of course, much less, because the population of the Northern Waterfront is very small (see the description of population in the Study Area, discussed previously). Based upon income data presented in the 1960 Census of Population, it is estimated that the population living in the Northern Waterfront had a total income of somewhat over $4 million in 1959 dollars. Given the increase in real personal income during the past seven years, plus additional population brought in by new residential development, it is likely that at the present time total personal income in the Study Area is $4-6 million.

Retail Sales

At the present time no definitive data about retail sales in the Northern Waterfront is available. However, by correlating broad data from the 1963

TABLE 6.

NUMBER OF EMPLOYEES IN EACH BUSINESS ACTIVITY BY SUBAREA

Business Activity	No. of Employees Subarea I	II	III	% of Activ.. Total	% of Subar. Total	Total Study Area	% Study Area
Printing and Allied Trades	0	1,215	1,030	-- 54.1 45.9	-- 41.4 9.6	2,245	14.4
Food and Beverage Processing	187	519	1,661	7.9 21.9 70.2	9.2 17.7 15.7	2,367	15.1
Transportation Industry	11	45	217	4.0 16.5 79.5	0.5 1.5 2.0	273	1.8
Manufacturing	57	78	641	7.3 10.1 82.6	2.8 2.7 6.0	776	4.9
Machine and Repair Shop	31	46	463	5.7 8.5 85.8	1.5 1.6 4.3	540	3.5
Warehousing (Incldg.Wholesale with Stock)	134	228	853	11.0 18.8 70.2	6.6 7.8 8.8	1,215	7.8
Warehousing (a) (Exc. Wholesale with Stock)	85	198	300	14.6 34.0 51.4	4.2 6.8 2.8	583	3.8
Warehousing (a) (Wholesale with Stock Only)	49	30	553	7.8 4.7 87.5	2.4 1.0 5.2	632	4.0
Special Trade Contracting	273	0	163	62.6 -- 37.4	13.4 -- 1.5	436	2.7
Chandlers and Marine Services	0	46	402	-- 10.3 89.7	-- 1.6 3.8	448	2.9

Continued

TABLE 6. Continued

Business Activity	No. of Employees Subarea I	Subarea II	Subarea III	% of Activ. Total	% of Subar. Total	Total Study Area	% Study Area
General Commercial	15	11	529	2.3 16.9 80.8	0.7 0.4 5.0	555	3.5
General Retail	229	83	24	68.2 24.7 7.1	11.3 2.8 0.2	336	2.2
Restaurants, Bars, and Entertainment	452	20	51	86.4 3.0 9.8	22.3 0.7 0.5	523	3.4
Motels and Hotels	61	0	34	64.2 -- 35.8	3.0 -- 0.3	95	0.6
General and Administrative Offices	285	340	4,313	5.8 6.9 87.3	14.0 11.6 40.4	4,938	31.5
Professional Offices	292	208	46	53.5 38.1 8.4	14.5 7.1 0.4	546	3.4
Laboratories	0	84	59	-- 58.7 41.3	-- 2.9 0.6	143	0.9
Institutional	2	0	171	1.2 -- 98.8	0.1 -- 1.6	173	1.2
Public Parking	2	9	22	6.0 27.3 66.7	0.1 0.4 0.2	33	0.2
Total	2,031	2,932	10,679			15,642	100.0

(a) These "subgroups" are a breakdown of the general Warehousing category and are not included as separate items as a per cent of the total number of employees.

Sources: See text.

Industry Category	No. of Employees	% of Industry Total	% of Subspace I	% of Subspace III	Total Study Area	% of Total Study Area
General	1,012	6.3	0.7	0.7	155	1.5
Commercial	4,317	26.9	5.0	5.0	788	7.6
Personal	2,012	12.5	1.6	1.6	295	2.8
Professional	1,256	7.8	0.4	0.4	566	5.4
Office	900	5.6	7.1	7.1		
Laboratories	0	0.0	0.0	0.0	0	0.0
Institutional	1	0.0	0.0	0.0	0	0.0
Public	2	0.0	0.0	0.0	0	0.0
Parking	1,012	6.3	0.4	0.4	32	0.3
Vacant	2,012	12.5	10,479	10,479	15,042	100.0

(a) These "subspaces" are a breakdown of the general Manufacturing category and are not included as separate items as a percent of the total number of employees.

Census of Business with retail employment, it was possible to derive a crude estimate of about $30 million of retail sales in the Study Area. This estimate represents about two percent of total retail sales in San Francisco. It is estimated that the large majority, or about 75 percent, of retail sales in the Study Area are made in Planning Area I, while Planning Areas II and III include about 15 percent and 10 percent, respectively, of retail sales in the Northern Waterfront.

Revenues to the City

The greatest single portion of general city revenue is derived from ad valorem (including inventory) taxes. Data pertaining to inventory taxes is not available; therefore, the following description of tax revenues from within the Northern Waterfront includes only revenues from assessments on real estate and physical improvements, based upon the 1963 tax rate of $9.23 per $100 valuation.

The greatest tax revenue is derived from that business activity which occupies the largest amount of land -- "Warehousing and Storage". The second most remunerative activity -- "Food Processing" -- occupies only one-fourth as much land as "Warehousing". "Multi-Family Residential", with the same return as "Food Processing", occupies about one-eighth as much land as "Warehousing". Table 6 in the report Northern Waterfront Planning Study (Department of City Planning, 1966) lists tax assessments and revenues in the Study Area according to land use activities.

The following table ranks land uses according to their 1963 tax revenues to the City and indicates the total area of land in the Northern Waterfront devoted to each use.

Table 7

1963 Tax Revenues, By Use

Use	Revenue	Land Area (acres)
Warehousing	$509,500	47.0
Food Processing	292,500	16.7
General & Admin. Offices	292,400	10.1
Multi-Family Residential	219,100	5.1
Printing	195,300	11.2
Motels and Hotels	151,400	4.7
General Retail	145,200	9.2
Restaurants, Entertainment	117,600	6.0
Institutional	108,300	4.3
Manufacturing	86,600	7.8
Vacant	77,300	13.4
Parking	71,300	17.2
Machine Shops	70,200	7.3
Transportation	61,100	17.5
Marine Services	51,000	5.3
General Commercial	33,700	2.6

Table 7 (Continued)

Use	Revenue	Land Area (acres)
Utilities	$ 32,700	10.3
Special Trade Contractors	30,500	2.6
Laboratories	16,400	0.9
Professional Offices	6,900	2.1
Single-Family Residences	5,600	1.0
Total	$2,573,600	203.7

This data indicates that in 1963 activities in the Northern Waterfront produced somewhat more than $2.5 million dollars in tax revenue, or $12,650 per acre of land (30 cents per square foot).

In addition to revenues derived from property taxes, the City also obtains revenue from activities within the Study Area through licenses, fees, user charges, etc. The following table indicates, by city department, the revenues obtained from these other sources:

Department	Estimated Revenues
Water	$201,500
Health	7,600
Recreation and Park	9,800
Tax Collector (Licenses and fees)	4,000
Municipal Railway	200,000
Total	$422,900

The City also obtains sales tax revenues from retail sales made in the Study Area. However, it is difficult to estimate sales according to the types covered by the sales tax; further data is being sought concerning this revenue source.

In summary, the City obtains about $3 million in revenue from property taxes and fees and licenses in the Study Area.

LAND USE

Land Use on Non-Port Property

The following table indicates the land areas devoted to the various activities within the Northern Waterfront; reference should also be made to the land use maps for the locational patterns of land use within the Study Area.

Of business activities, warehousing occupies the greatest amount of land -- about one-fifth of all land (excluding streets) in the Study Area.

TABLE 8

LAND AREAS IN SQUARE FEET and ACRES OF EACH SUBAREA BY BUSINESS ACTIVITY and OTHER LAND USE CLASSIFICATIONS

Business Activity (Part A)	Land Area (1000's Sq. Ft.) Subarea I	II	III	% of[a] Activity Total	% of[b] Subarea Total	Tot.Areas 1000's Sq. Ft. / Acres	% of[c] Total Study Area
Printing and Allied Trades	0	187.5	299.0	- 38.5 61.5	- 11.8 5.4	486.5 11.2	6.6
Food and Beverage Processing	144.8	222.8	360.6	19.8 30.6 49.6	4.4 14.0 6.5	728.2 16.7	10.0
Transportation Industry	283.9	40.5	438.9	37.2 5.3 57.5	8.6 2.5 8.0	763.3 17.5	10.3
Manufacturing	33.5	32.8	275.5	9.8 9.5 80.7	1.0 2.1 5.0	341.8 7.8	4.6
Machine and Repair Shops	37.5	54.4	226.2	11.7 17.1 71.2	1.1 3.4 4.1	318.0 7.3	4.3
Warehousing (incl.Whole. with Stock)[e]	157.4	617.4	1,272.0	7.6 30.2 62.2	4.8 38.8 23.1	2,046.8 47.0	27.6
Special Trade Contracting	58.6	0	53.3	52.4 - 47.6	1.8 - 1.0	111.8 2.6	1.5
Chandlers and Marine Serv.	0	15.6	214.3	- 6.7 93.3	- 1.0 3.9	229.9 5.3	3.1
General Commercial	3.3	55.1	56.2	2.8 48.1 49.1	0.1 3.5 1.0	114.6 2.6	1.6
General Retail	168.3	95.1	135.3	42.2 23.8 34.0	5.1 6.0 2.5	398.7 9.2	5.4
Restaurants Bars and Entertainment	218.9	13.4	31.0	83.2 5.0 11.8	6.7 0.8 0.6	263.3 6.0	3.6

Continued

TABLE 8. Continued

Business Activity (Part A)	Land Area (1000's Sq. Ft.) Subarea I	II	III	% of (a) Activity Total	% of (b) Subarea Total	Tot.Areas 1000's Sq. Ft. / Acres	% of (c) Total Study Area
Motels and Hotels	166.5	0.8	37.0	81.5 0.4 18.1	5.1 0.1 0.7	204.4 4.7	2.8
General and Administrat. Offices	141.4	42.7	287.4	30.0 9.0 61.0	4.3 2.7 5.2	471.5 10.8	6.4
Professional Offices	65.5	21.0	3.2	73.2 23.3 3.5	2.0 1.3 0.1	89.5 2.1	1.2
Laboratories	0	19.0	21.5	- 46.8 53.2	- 1.2 0.4	40.4 0.9	0.5
Institutional	113.4	18.9	55.3	60.4 10.1 29.5	3.4 1.2 1.0	187.6 4.3	2.1
Public Parking	155.7	48.0	388.0	26.3 8.1 65.6	4.5 3.0 7.0	591.7 13.6	8.0
Sub-Totals (1000's Sq. Ft.)	1,748.7	1,484.7	4,154.7		100.0 100.0	7,388.1	100.0
Acres	40.1	34.1	95.4		100.0	169.6	

(a) Land areas for each of the three Subareas are expressed as a per cent of the total area for each business activity.

(b) In addition, the same subdivisions are shown as a per cent of the total of each subarea.

(c) Showing proportion of total land area occupied by business activities.

Continued

TABLE 8. Continued

Land Use (Part B)	Land Area (1000's Sq. Ft.) Subarea I	Subarea II	Subarea III	% of[a] Use Total	% of[b] Sub-area Total	Tot.Areas 1000's Sq. Ft. / Acres	% of[c] Total Study Area
Private Parking	0	43.8	115.4	- 27.5 72.5	- 2.8 2.1	159.2 3.6	1.6
Single Family Residential	36.3	4.1	3.5	82.7 9.3 7.9	1.1 0.3 0.1	43.9 1.0	0.4
Multi-Family Residential	235.6	0	18.4	92.8 - 7.2	7.2 - 0.3	254.0 5.8	2.5
Utilities	381.1	0	67.9	84.9 - 15.1	11.6 - 1.2	449.0 10.3	4.5
Parks, Playgd. Private Recreation	364.5	17.4	37.8	86.9 4.1 9.0	11.1 1.1 0.7	419.7 9.6	4.2
Vacant Property	504.4	43.2	36.4	86.4 7.4 6.2	15.5 2.7 0.7	584.0 13.4	5.5
Public Facilities	19.8	0	370.3	5.0 - 95.0	0.6 - 6.7	389.8 9.0	2.9
Freeways	0	0	708.2	- - 100.0	- - 12.8	708.2 16.3	4.1
TOTAL [d] (1000's Sq. Ft.)	3,290.4	1,593.2	5,512.6			10,396.1	
Acres	75.5	36.6	126.6			238.7	

(d) Totals and percentages are based on all land uses and business activities including both Parts A and B.

Transportation activities and food processing firms are also extensive users of land, but together they occupy less land than do warehousing activities. Other activities which are major users of land in the Study Area include general and administrative offices, printing, general retail, parking, transportation, and utilities. Residential uses and park and recreation areas together comprise only seven percent of all land (excluding streets) in the Northern Waterfront.

The distribution of land use activities among the three planning areas within the Northern Waterfront parallels the pattern of employment distribution, as might be expected. Land use in Planning Area I is basically comprised of retail, restaurant and entertainment, motel and hotel, and professional office activities, while land use in Planning Area II is characterized by printing, food processing, and warehouse activities. Land use in Planning Area III is concentrated in general administrative offices and such light industrial activities as printing, food processing, manufacturing, machine shops, warehousing, and marine services. Nearly all of the residential development in the Northern Waterfront is located in Planning Area I.

Land Use on Port Authority Property

At the present time Port Authority property is used in the manner illustrated in the following table, which indicates that about 73 percent of all Port property is used for cargo handling and related transportation activities (including parking areas for commercial transportation, passenger terminals, truck terminal and related drayage activity, and railroad activities); warehousing and storage activities are located on about 10 percent of the Port property. The remaining 17 percent of Port property is used by non-Port activities and includes as major users restaurants, bars, and entertainment activities, institutions, and public parking.

Land Use Intensity Measurements

The following sections indicate the intensity of land use for various activities in terms of dwelling units, population, employment, and property tax revenues.

Dwelling Units Per Net Acre of Residential Land.

Table 10 indicates that residential land is most intensely used in Planning Area I, although this rate of intensity is only slightly above the average intensity for the Study Area as a whole. The net residential density of single-family dwelling units is, of course, much less than that for multi-family units.

Population Per Net Acre of Residential Land.

Table 11 indicates that net population densities are highest in Planning Area I, for population living in single-family dwellings as well as for population living in multi-family structures. The density of population living in multi-family dwelling units is more than eleven times greater in Planning Area I than in Planning Area III.

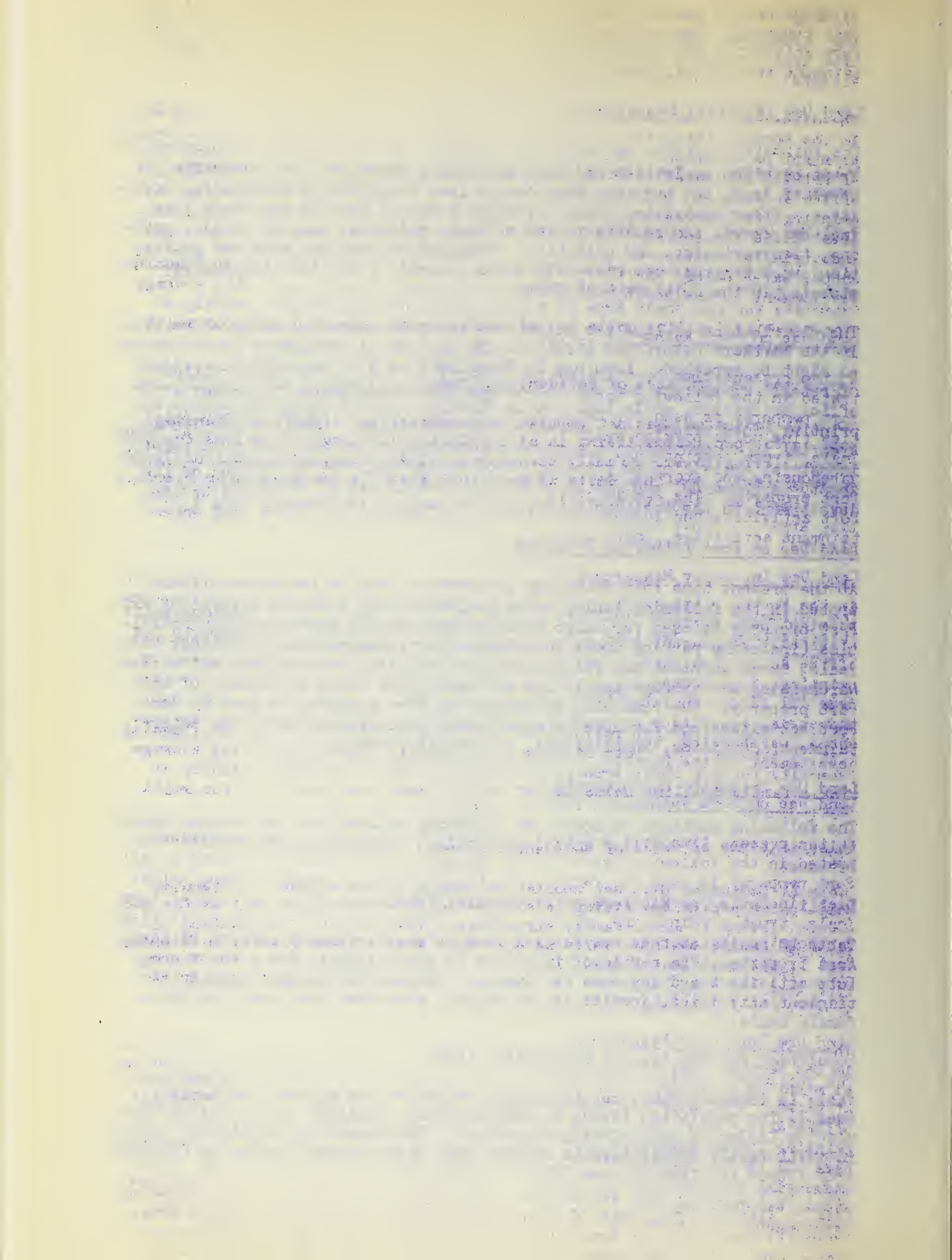


Table 9

MAJOR ACTIVITIES ON PORT AUTHORITY PROPERTY

Activity	Total Area (sq. ft.)	Percent of Total
Printing & Allied Trades	585	-
Food & Beverage Processing	119,226	1.8 %
Transportation	4,796,064	73.1
Manufacturing	12,466	0.2
Machine and Repair Shops	133,556	2.0
Warehousing and Storage	648,999	9.9
Special Trade Contractors	12,343	0.2
Chandlers & Marine Services	58,046	0.9
General Commercial	72,668	1.1
General Retail	6,964	0.1
Restaurants, Bars, Entertainment	164,968	2.5
Motels and Hotels	-	-
General & Admin. Offices	101,336	1.5
Professional Offices	47,234	0.7
Laboratories	328	-
Institutional	206,220	3.1
Public Parking	187,662	2.9
		100.0 %
TOTAL	6,566,665	

Source: Arthur D. Little, Inc.

Table 10

DWELLING UNITS PER NET ACRE OF RESIDENTIAL LAND

Planning Area	Dwelling Units		Net Land Area (acres)		Dwelling Units Per Net Residential Acre	
	Single Family	Multi-Family	Single Family	Multi-Family	Single Family	Multi-Family
I	18	619	0.8	5.4	22.5	114.5
II	1	(a)	0.1	(a)	10.0	(a)
III	2	32	0.1	0.4	20.0	80.0
ndy Area	21	651	1.0	5.8	21.0	112.5
Total		672		6.8		99.0

Planning Area II includes 18 dwelling units in multi-family structures but these uses are secondary to non-residential uses on the same sites and are not allocated any portion of land in this case.

Table II

POPULATION PER NET ACRE OF RESIDENTIAL LAND

ning a	Estimated Population		Net Residential Land Area (acres)		Estimated Population Per Net Residential Acre	
	In Single-Family Units	In Multi-Family Units	Single-Family Units	Multi-Family Units	Single-Family Units	Multi-Family Units
I	75	1225	0.8	5.4	93.7	226.9
I	4	(a)	0.1	(a)	40.0	(a)
II	8	79	0.1	0.4	80.0	19.7
y Area	87	1304	1.0	5.8	87.0	224.8
tal		1391		6.8		204.6

Planning Area II includes an estimated 45 persons living in multi-family structures; however, because these dwelling units are secondary to non-residential uses on the same sites, and are not allocated any portion of land in the area, this population is not included in estimating population per net residential acre of land.

Employment Density.

The following table indicates the density of employment within the Study Area according to the number of employees per net square foot of land by various land use activities. This data reveals that the greatest density of employment is found in general administrative office uses; other uses which have a high employment density include printing, food processing, general commercial, special trade contractors, and professional offices. In general, employment densities are highest in Planning Area III and lowest in Planning Area I.

Tax Revenue Per Employee.

The following table indicates property tax revenues per employee for each type of business activity within the Northern Waterfront. The greatest amount of tax revenue per employee is obtained from motels and hotels; other activities showing high amounts of tax revenue per employee include general retail, warehousing, and institutions; lowest amounts of tax revenue per employee are obtained from professional offices, general administrative offices, general commercial activities, and special trade contractors. In general, the highest revenues-per-employee rates are found in Planning Area I (where motels and retail shops are concentrated), and the lowest rates are found in Planning Area III.

Tax Revenues Per Unit Land Area.

The following table indicates property tax revenues per square foot of land area for each business activity in the Study Area. Tax revenues per square foot of land area are lowest for transportation uses and professional offices, while they are highest for motels, general administrative offices, and institutions. In the entire Study Area, the City receives about 30 cents of tax revenue per square foot of land in business activities. The average return is somewhat higher in Planning Area I and somewhat lower in Planning Area III.

Table 12

SITE AREA PER EMPLOYEE FOR BUSINESS ACTIVITIES

ness ity	Planning Area I			Planning Area II			Planning Area III			Study Area		
	Sq. Ft. (1000)	Emp.	Sq. ft. Emp.	Sq. Ft. (1000)	Emp.	Sq. ft. Emp.	Sq. Ft. (1000)	Emp.	Sq. ft. Emp.	Sq. Ft. (1000)	Emp.	Sq. ft. Emp.
ing	–	–	–	187.5	1215	154	299.0	1030	291	486.5	2245	212
Processing	144.8	187	775	222.8	519	430	360.6	1661	220	728.2	2367	307
ortation	283.9	11	2580	40.5	45	900	438.9	217	2020	763.3	273	2790
acturing	33.5	57	590	32.8	78	420	275.5	641	430	341.8	776	440
e Shop	37.5	31	121	54.4	46	1180	226.2	463	490	318.1	540	590
using	157.4	134	1157	617.4	228	2710	1272.0	853	1475	2046.8	1215	1685
ousing t Stock	N.A.	85	N.A.	N.A.	198	N.A.	N.A.	300	N.A.	N.A.	583	N.A.
le Stock	N.A.	49	N.A.	N.A.	30	N.A.	N.A.	553	N.A.	N.A.	632	N.A.
Contr.	58.6	273	214	–	–	–	53.3	163	328	111.9	436	256
Services	–	–	–	15.6	46	338	214.3	402	535	229.9	448	513
l Comm.	3.3	15	220	55.1	11	5000	56.2	529	106	114.6	555	206
Retail	168.3	229	735	95.1	83	1145	135.3	24	5650	398.7	336	1185
s, + Enter.	218.9	452	485	13.4	20	670	31.0	51	608	263.3	523	504
and Hotels	166.5	61	2740	0.8	x	x	37.0	34	1089	204.3	95	2160
Admin.	141.4	285	496	42.7	340	125	287.4	4313	67	471.5	4938	95
ional	65.5	292	224	21.0	208	101	3.2	46	70	89.7	546	164
tories	–	–	–	19.0	84	226	21.5	59	365	40.5	143	282
ational	113.4	2	5670	18.9	x	x	55.3	171	323	187.6	173	1083
Parking	155.7	2	7785	48.0	9	5350	388.0	22	1760	591.7	33	1790
TAL "A"	1748.7	2031	860	1465.3	2932	500	4,154.7	10679	389	7368.7	15642	
tal "B"	–	–	–	19.7	x	x	–	–	–	19.7	x	x
L	1748.7	2031	860	1485.0	2932	506	4,154.7	10679	389	7388.4	15642	

Table 13

TAX REVENUES PER EMPLOYEE

ıcss try	Planning Area I			Planning Area II			Planning Area III			Study Area		
	Rev.[1]	Emp.	Rev./Emp.	Rev.[1]	Emp.	Rev./Emp.	Rev.[1]	Emp.	Rev./Emp.	Rev.[1]	Emp.	Rev./Emp.
ing	–	–	–	73.8	1215	$60	121.5	1030	$118	195.3	2245	$87
Processing	41.2	187	$220	57.6	519	111	193.7	1661	117	292.5	2367	123
portation	2.1	11	192	9.6	45	213	49.4	217	227	61.1	273	224
facturing	6.8	57	119	11.6	78	149	68.2	641	106	86.6	776	112
ine Shop	6.8	31	219	17.6	46	383	45.8	463	99	70.2	540	130
using	42.9	134	320	205.6	228	900	261.0	853	306	509.5	1215	419
al Contr.	16.4	273	60	–	–	–	14.1	163	87	30.5	436	70
Services	–	–	–	2.5	46	54	48.5	402	120	51.0	448	117
l Comm.	1.3	15	87	12.3	11	1120	20.1	529	38	33.7	555	60
al Retail	79.7	229	348	34.5	83	416	31.0	24	1290	145.2	336	433
ars, Enter.	95.1	452	210	4.5	20	225	18.0	51	353	117.6	523	225
and Hotels	129.8	61	2120	0.4	x	x	24.2	34	710	154.4	95	1630
l Admin.	122.7	285	430	14.6	340	43	155.1	4313	36	292.4	4938	59
ional	2.3	292	8	3.5	208	17	1.1	46	24	6.9	546	13
ratories	–	–	–	10.9	84	130	5.5	59	93	16.4	143	115
utional	27.4	2	13200	3.3	x	x	77.6	171	453	108.3	173	631
Parking	–	–	–	–	–	–	–	–	–	–	–	–
OTAL "A"	574.5	2031	$283	458.6	2932	$157	1134.8	10679	$106	2167.9	15642	$139
al "B"	–	–	–	3.7	x	x	–	–	–	3.7	x	x
–	574.5	2031	$283	462.3	2932	$157	1134.8	10679	$106	2171.6	15642	$139

[1] Thousands of dollars (based on 1963 tax rate).

Table 14
TAX REVENUE PER SQUARE FOOT OF LAND

ness / ity	Planning Area I			Planning Area II			Planning Area III			Study Area		
	Rev. ($1000)	Sq. Ft. (1000)	Rev. SQ.FT.	Rev. ($1000)	Sq. Ft. (1000)	Rev. Sq.FT.	Rev. ($1000)	Sq. Ft. (1000)	Rev. SQ.FT	Rev. ($1000)	Sq. Ft. (1000)	Rev. SQ.FT.
ing	–	–	–	$73.8	187.5	$.394	$121.5	299.0	$.406	$195.3	486.5	$.400
rocessing	$41.2	144.8	$.290	57.6	222.8	.260	193.7	360.6	.537	292.5	728.2	.401
ortation	2.1	283.9	.007	9.6	40.5	.237	49.4	438.9	.113	61.1	763.3	.080
facturing	6.8	33.5	.203	11.6	32.8	.354	68.2	275.5	.247	86.6	341.8	.253
e Shop	6.8	37.5	.181	17.6	54.4	.324	45.8	226.2	.202	70.2	318.1	.221
ousing	42.9	157.4	.272	205.6	617.4	.334	261.0	1272.0	.205	509.5	2046.8	.249
. Contr.	16.4	58.6	.280	–	–	–	14.1	53.3	.265	30.5	111.9	.272
. Services	–	–	–	2.5	15.6	.160	48.5	214.3	.225	51.0	229.9	.222
l Comm.	1.3	3.3	.390	12.3	55.1	.224	20.1	56.2	.358	33.7	114.6	.295
l Retail	79.7	168.3	.473	34.5	95.1	.363	31.0	135.3	.229	145.2	398.7	.365
rs, Enter.	95.1	218.9	.434	4.5	13.4	.336	18.0	31.0	.580	117.6	263.3	.446
and Hotels	129.8	166.5	.780	0.4	0.8	.500	24.2	37.0	.655	154.4	204.3	.755
Admin.	122.7	141.4	.870	14.6	42.7	.342	155.1	287.4	.540	292.4	471.5	.622
sional	2.3	65.5	.035	3.5	21.0	.166	1.1	3.2	.340	6.9	89.7	.077
itories	–	–	–	10.9	19.0	.575	5.5	21.5	.256	16.4	40.5	.405
utional	27.4	113.4	.241	3.3	18.9	.174	77.6	55.3	1.400	108.3	187.6	.577
Parking	–	155.7	x	–	48.0	x	–	388.0	x	–	591.7	x
TOTAL "A"	$574.5	1593.0	$.360	$462.3	1437.0	$.321	$1134.8	5766.7	$.301	$2171.6	6796.7	$.320
am. res.	4.2	36.3	.115	1.0	4.1	.244	0.4	3.5	.011	5.6	43.9	.127
m. res.	211.5	235.6	.900	–	–	–	3.6	18.4	.195	215.1	254.0	.850
	32.7	381.1	.086	–	–	–	–	67.9	x	32.7	449.0	x
	74.6	504.4	.148	–	43.2	x	2.8	36.4	.077	77.4	584.0	x
g	19.6	–	x	11.0	43.8	.251	40.7	115.4	.352	71.3	159.2	x
al "B"	$342.6	1157.4	x	$12.0	91.1	x	$47.5	291.6	x	$402.1	1490.1	x
	$917.1	2906.1	x	$474.3	1576.1	x	$1182.3	4396.3	x	$2573.7	8878.5	x

GENERALIZED FUNCTIONAL RELATIONSHIPS

An analysis has been completed of the general functional relationships found in the Northern Waterfront. The analysis is summarized below according to four kinds of functional relationships.

FUNCTIONAL RELATIONSHIPS BETWEEN THE STUDY AREA AND THE BAY REGION

This analysis dealt with the fact that, in relation to the Bay Region (the metropolitan area), the Northern Waterfront is a place for the transport of goods, for leisure and entertainment, and for employment. The Study Area is physically linked to the metropolitan area through transportation and communication and also visually (both as "seen" and as an "image" of San Francisco).

FUNCTIONAL RELATIONSHIPS BETWEEN THE STUDY AREA AND THE PORT

A map has been prepared to illustrate the use of Port facilities by firms located in the Study Area. This map indicates the location within the Study Area of firms which import or export goods and products through the Port, according to a classification of the percentage of each firm's total goods and products which are shipped by water through the San Francisco Port.

This analysis indicates that: (a) few firms have a major direct relationship to the Port; (b) those that do are of a transportation, warehousing, and food processing nature; (c) most of these firms with direct relationships are located south of Market Street in Planning Area III, although some are located in Planning Area II; and (d) the locational preferences of most firms in the Study Area are based on factors other than the availability of water transportation.

FUNCTIONAL RELATIONSHIPS BETWEEN THE STUDY AREA AND THE CITY

Also completed was an analysis of functional linkages between activities in the Study Area and other functional activities in the City. This analysis indicates that the activities in the Fisherman's Wharf area are directly related to tourism, downtown employment centers and business activities, and nearby residential areas (including Telegraph Hill, Russian Hill, and Nob Hill areas).

Significant relationships are found between printing firms and professional offices in Planning Area II and office and business activities in downtown San Francisco.

Major functional relationships are also found between office and general commercial activities in Planning Area III (south of Market Street) and downtown business activities.

[illegible]

[illegible]

[illegible]

FUNCTIONAL RELATIONSHIPS BETWEEN ACTIVITIES WITHIN THE STUDY AREA

An analysis of "internal" functional relationships between activities located within the Northern Waterfront has also been completed. The following diagram indicates the primary and secondary functional linkages between various activities in the Study Area. Based upon this analysis, activities can be abstractly related physically in both two- and three-dimensional form.

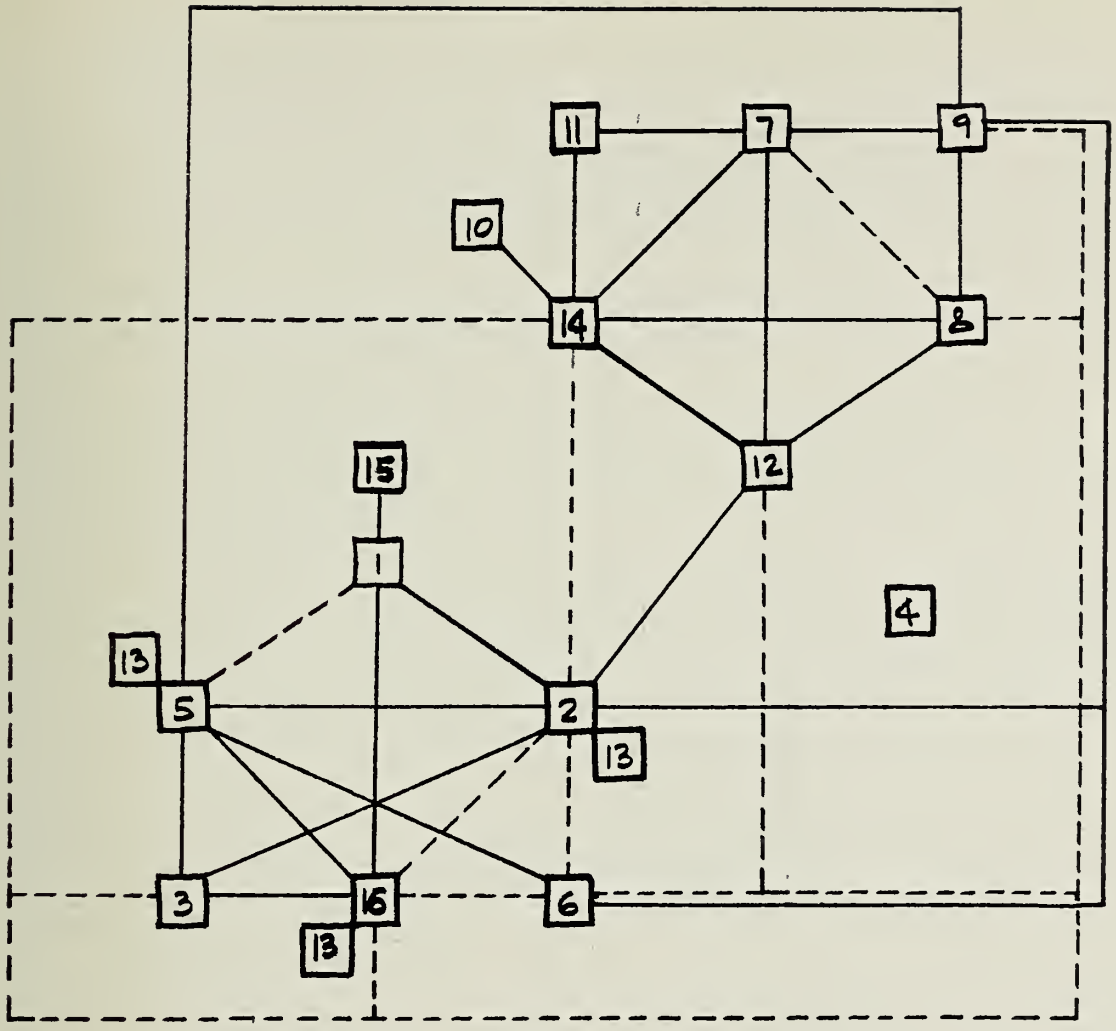


Figure 2

· DIAGRAM OF FUNCTIONAL RELATIONSHIPS

residential	9 printing
general retail	10 marine services
hotels, motels	11 industrial services
institutions	12 warehousing
prof. & admin. offices	13 public parking
general commercial	14 transportation
manufacturing	15 public open space
food processing	16 rest., bars, entertainment

——— PRIMARY FUNCTIONAL RELATIONSHIP

– – – – – SECONDARY FUNCTIONAL RELATIONSHIP

SECTION 2: PHYSICAL CHARACTERISTICS

NATURAL PHYSICAL CHARACTERISTICS

TOPOGRAPHY AND DRAINAGE

The topography of land within the Study Area is generally level; much of the land in the area was created by filling in the bay. Portions of the Northern Waterfront where significant changes in landform occur include Rincon Hill and the area west of Columbus Avenue, as well as peripheral edges of Telegraph Hill.

Of perhaps more significance are the landforms adjacent to the Study Area, for these affect the pattern of natural drainage through the Northern Waterfront (and also offer vantage points for views of the Study Area); these adjacent landforms include Russian Hill and Telegraph Hill and the valleys formed between Russian and Telegraph Hills, Telegraph and Rincon Hills, and between Rincon Hill and China Basin.

The accompanying map indicates landforms within the Study Area and points out areas of steep terrain which pose development problems and also describes the pattern of natural drainage.

SUBSURFACE CONDITIONS

Two accompanying maps describe subsurface soil and geologic conditions found within the Northern Waterfront. The first map indicates the subsurface elevation of bedrock in the Study Area. Three significant areas exist where bedrock is found virtually at the surface--Telegraph Hill, Rincon Hill, and the base of Russian Hill. Along the Embarcadero seawall, bedrock is generally found more than 100 feet below the surface, while at the pierhead line its subsurface elevation is generally greater than 175 feet. Bedrock is also found at greater depths in the area between Howard and Market Streets (an area which was originally open water but was subsequently filled).

The second map describes the types of soils found in the Study Area. Obviously, where the above map indicated the location of surface bedrock is where geologic formations are basically sandstone or mixtures of shale and sandstone. Outside of the Rincon Hill area, the vast majority of soil is composed of artificial fill.

The properties of various soils have implications for the suitability and costs of different kinds of development. The following table indicates the engineering properties of soils found within the Northern Waterfront.

Information about ground water levels in the Study Area is very limited. The depth of the water table is quite variable over the entire area and also

Table 15

ENGINEERING PROPERTIES OF SOILS IN THE STUDY AREA

	Composition	Weathering Soil Development Alteration	Permeability
...ial	Mostly dune sand, but includes silt, clay, rock waste, man-made debris, and organic waste.	None.	High, except where clayey materials predominate.
...ebris ...ine Fill [1]	Unsorted rock fragments, gravel sand, silt, and clay in various proportions	Generally none.	High
...nd ...-bedded ...tone [2]	Shale interbedded with fine-grained sandstone.	Maximum depth of weathering, 30 feet.	Low
...stone	Tough and non-porous fine-to-coarse grained.	Average depth of weathering, 30 feet.	Generally Low.
...e ...d	Uniform fine-to-medium grained sand.	Slight to none.	High.

[1] ...e debris and ravine fill, fine-to-medium grained sand soil has same general properties.
[2] ...dstone and shale, undifferentiated, has same general properties.

Table 15 (cont.)

ENGINEERING PROPERTIES OF SOILS IN THE STUDY AREA

:il ife	Workability	Slope Stability	Earthquake Stability
cial	Generally easy to remove except locally where tangles of ship timbers and other debris are encountered.	Generally low.	Poor to fair.
. Debris buine Fill	Variable, but generally easily compacted and excavated.	Generally unstable when wet.	Moderate.
. and Bedded dstone	Fresh rock difficult to move; support required for excavation. Altered rock moved readily.	Generally stable.	High in fresh rock. Probably moderate in altered rock.
stone	Fresh rock usually requires blasting; Altered rock moves readily.	Generally stable.	High.
2 s	Compacts rapidly; easily excavated.	Generally unstable and free running. Susceptible to erosion. Excavation walls require support lagging.	Probably moderate.

Table 15 (cont.)

ENGINEERING PROPERTIES OF SOILS IN THE STUDY AREA (cont.)

oil Type	Shearing Strength Foundation Conditions	Unit Weight (lbs./cu.ft.)
rificial ill.	Generally moderate shearing strength, but quite variable depending on method of placement, age, thickness, underlying material, etc.	Variable within wide limits.
g. Debris lanine Fill.	Variable.	104 to 124
l and - Bedded dstone.	Generally high.	127 to 142
dstone	Generally high.	128 to 144
ene end	Moderate to high shearing strength when confined.	65 to 102 at surface; 110 when compacted.

within very small areas. For example, a foundation was once excavated at the corner of Montgomery and Commercial Streets to a depth of 30 feet below the surface (and about 15 feet below mean sea level), and no water was found; however, 150 feet from this location, water was found within 5 feet of the surface. Furthermore, in some areas it has been found that ground water levels have dropped substantially over time because of the increase of storm water drainage systems, deeper foundations, and a reduced area subject to direct rainfall (due to building coverage and pavements), which tends to decrease the amount of water seeping into subsurface soils. About all that can be said generally is that within the Northern Waterfront ground water may or may not be found in detrimental amounts or under pressure, but it is likely that it will be found to some extent fairly close to the surface.

CLIMATE

The following discussion describes climatic conditions which must be considered in planning for the development of the Northern Waterfront. No data is currently available for the specific area included within this study; therefore, this discussion is based upon available data for the City of San Francisco.

SUN

The position of the sun as it passes over San Francisco during the summer solstice at 8:00 A.M. and 4 P.M. is an azimuth of 90 degrees east or west of north and an altitude of 35 degrees from the horizon, while at 12 noon its azimuth position is 0 degrees and its altitude is 75 degrees; comparable figures for the winter solstice are 53 degrees (azimuth) and 7 degrees (altitude) at 8:00 A.M. and 4:00 P.M., and 0 degrees azimuth and 35 degrees altitude at 12 noon.

It can be anticipated that, throughout the year, sunshine will be possible in downtown San Francisco during an average of 66 percent of the daylight hours.

TEMPERATURE

Because of its unique location at the end of a peninsula lying between the ocean and the bay, San Francisco is known as an air conditioned city with cool pleasant summers and mild winters. As a result of the steady sweep of air from the ocean, there are few extremes of heat or cold. Over the course of a year, the normal daily maximum temperature is about 62.8 degrees and the normal daily minimum temperature is about 50.9 degrees; the normal average monthly temperature is 56.8 degrees. The highest recorded temperature was 101 degrees during June, 1961, while the lowest recorded temperature was 30 degrees in January, 1937. During the entire 88 years of temperature records in San Francisco, temperatures have risen to 90 degrees or higher on an avera-e of only once a year and dropped below freezing less than once a year. Abnormally warm or cool periods usually last but a few days.

WIND

The occurrence of wind in San Francisco is influenced by differences between land and sea temperatures and atmospheric pressures. Prevailing winds are from the west at a mean speed of 8.7 miles per hour, although the highest wind speed ever observed occurred in January, 1965, from the southeast at a speed of 47 miles per hour.

During the summertime, the temperature of the Pacific Ocean is unusually low near the coast and atmospheric pressure is relatively high, while inland areas are characterized by the opposite of both conditions. This situation tends to strongly intensify the landward movement of air and to make the prevailing westerly winds brisk and persistant, especially during the period from May to August. For example, the mean monthly wind speed during July is 11.2 miles per hour, compared to a mean monthly wind speed during November of 6.3 miles per hour. (These two months represent the occurrence of average high and low wind speeds).

Winds from the land are extremely rare in summer and usually result only in some diminuation of the cool onshore winds.

FOG

Sea fogs, and the low stratus cloudiness associated with them, constitute another striking characteristic of San Francisco's climate. Fog conditions are especially prevalent during the period from May to August, when the fog or low-lying stratus cloudiness off the coast is carried inland by the strong westerly winds during the afternoon or night and evaporated during the subsequent forenoon.

However, within the City there are differences in fog conditions, the most obvious being the greater frequency and duration of fogs along the Pacific Coastal side of the City. Within the Northern Waterfront, the occurrence of low fog conditions is much less than in the westerly parts of the City.

RAINFALL

Pronounced wet and dry seasons are another characteristic of San Francisco's climate. On the average, 84 percent of the total annual precipitation falls during the five-month period between November and March, leaving only 16 percent for the remaining seven months of the year. Measurable amounts of precipitation fall on less than 70 days a year. Normal total annual precipitation is 20.8 inches.

CHARACTERISTICS OF THE SAN FRANCISCO BAY

U.S. Corps of Engineers' studies of various barrier plans have provided much significant information about the physical characteristics and functional operation of San Francisco Bay. These notes summarize those aspects which have a direct bearing upon planning for development of the Northern Waterfront.

Tides

The tides in San Francisco Bay are of the mixed type, in which two high and two low waters occur in a day, but with marked differences between the two high waters or between the two low waters. The mixed type of tide arises as a mixture of semi-daily and daily tides.

In the case of San Francisco Bay, the forenoon tides differ considerably from the afternoon tides. Considerable daily inequality may exist in both the high and low waters, but is more pronounced in the low waters, sometimes being three times as great as in the high waters. About every 14 days, the two high waters and the two low waters occurring during the day usually reach about an equal height.

The following tables list the tidal elevations at approximate points along the Northern Waterfront study area, and indicate the mean ranges of tide and elevations at these same points.

Water Temperature

No detailed water temperature data for the Northern Waterfront study area is available from the Corps of Engineers' barrier studies. However, general interpretations indicate that water temperatures in the study area are as follows:

(a) Water temperature is generally cold, varying from a low of about 50 degrees to a high of about 60 degrees over a 12-month period.

(b) Coolest water temperatures are found during the months of November through April.

(c) Warmest water temperatures are found during the months of July through September.

Geology and Soils

Geologic formations in San Francisco Bay are alluvial formations that are adjacent to the margins of the bay and lie beneath the water. The geologic structure of the bay is composed of three major soil layers:

1. Older Bay Mud Formation or Firm Clay (lowest layer). This material consists of firm clay, and it offers moderately good resistance to the penetration of piles and casings for all except heavy loads. It lies over bedrock in thicknesses from 0-200 feet.

2. Sand Deposits (middle layer). Some local areas within the bay contain amounts of fine-grained sand; these sand layers are thicker near the margins of the bay than near the center.

Table 16

TIDAL ELEVATIONS[1]

Tidal Elevation	Approximate Location			
	Aquatic Park	Bay Bridge	China Basin	Golden Gate
gest Tide (est.)	5.23 feet	5.41	5.50	5.10
a higher high water	2.80	2.96	3.03	2.81
ea high water	2.21	2.38	2.42	2.05
ea half tide	0.10	0.17	0.19	0.02
a low water	-2.01	-2.09	-2.12	-1.93
a lower low water	-3.15	-3.21	-3.23	-3.05
west tide (est.)	-5.71	-5.78	-5.80	-5.65

[1] All elevations referenced to mean sea level (MSL) as measured at Golden Gate Bridge = 0.0 feet.

Table 17

MEAN RANGES OF TIDE AND ELEVATIONS

Tidal Elevation	Approximate Location			
	Aquatic Park	Bay Bridge	China Basin	Golden Gate
ea high water	2.21 feet	2.38	2.42	2.05
ea low water	-2.01	-2.09	-2.12	-1.93
ean range	4.22	4.47	4.54	3.98

Source: U.S. Army Corps of Engineers.

3. Younger Bay Mud (uppermost layer) is of two types:

   (a) Semi-Consolidated Bay Mud varies from 40-70 feet below the top of soft bay mud and from 40-170 feet below mean lower low water level.

   (b) Soft Bay Mud overlies the Semi-Consolidated Bay Mud, and is the clayey, plastic, low-strength material that is typified by material in the tide flats and immediately beneath the water. This material tends to flow when loaded, and piles other than wood or casings tend to sink of their own weight.

Design Values for Bay Soils.

The following design values are used for the bay soils discussed above:

1. Undisturbed soft bay mud foundations:

   $C = 80 + 4.3d$ where C = strength of cohesion in pounds per square foot, and d = depth in feet of mud above the plane being analyzed.

2. Disturbed soft bay mud foundations: The same value of strength is used for undisturbed and disturbed bay mud.

3. Semi-consolidated bay mud foundations: 1000 pounds per square foot.

4. Firm clays and sands foundations: 2000 pounds per square foot.

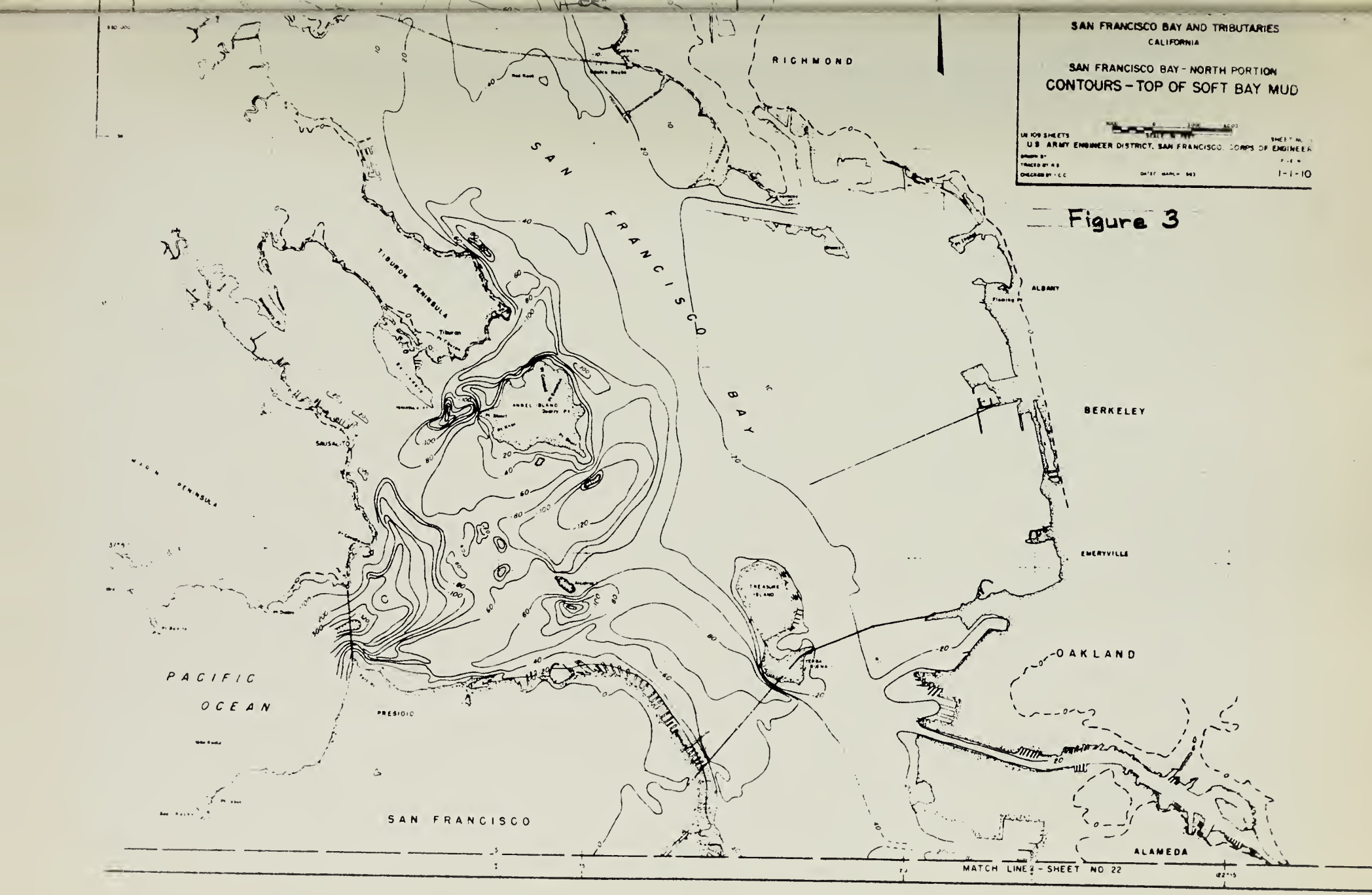
5. Bedrock foundations: 36 tons per square foot for normal loading, and 54 tons per square foot for earthquake conditions in unweathered bedrock. Corresponding values of 20 and 30 tons per square foot are assumed for weathered bedrock.

6. Bay mud interior fills: 50 pounds per square foot.

The accompanying maps indicate the contours of the top of soft bay mud and the top of firm clays and sands in the vicinity of the Northern Waterfront. The contours of the top of bedrock are shown on the map which described land area soil conditions.

Pollution Dispersal

One of the purposes of the Bay Model studies was to test the dispersal of pollutants in San Francisco Bay. The objective of these tests was to provide information that would assist in evaluating the waste assimilative capacity of the San Francisco Bay System under existing conditions (and the effects on this capacity of barriers proposed for various locations in the


SAN FRANCISCO BAY AND TRIBUTARIES
CALIFORNIA
SAN FRANCISCO BAY - NORTH PORTION
CONTOURS - TOP OF SOFT BAY MUD
U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO, CORPS OF ENGINEERS
1-1-10
Figure 3
RICHMOND
SAN FRANCISCO BAY
TIBURON PENINSULA
ALBANY
BERKELEY
EMERYVILLE
OAKLAND
ALAMEDA
PACIFIC OCEAN
PRESIDIO
SAN FRANCISCO
MATCH LINE - SHEET NO 22

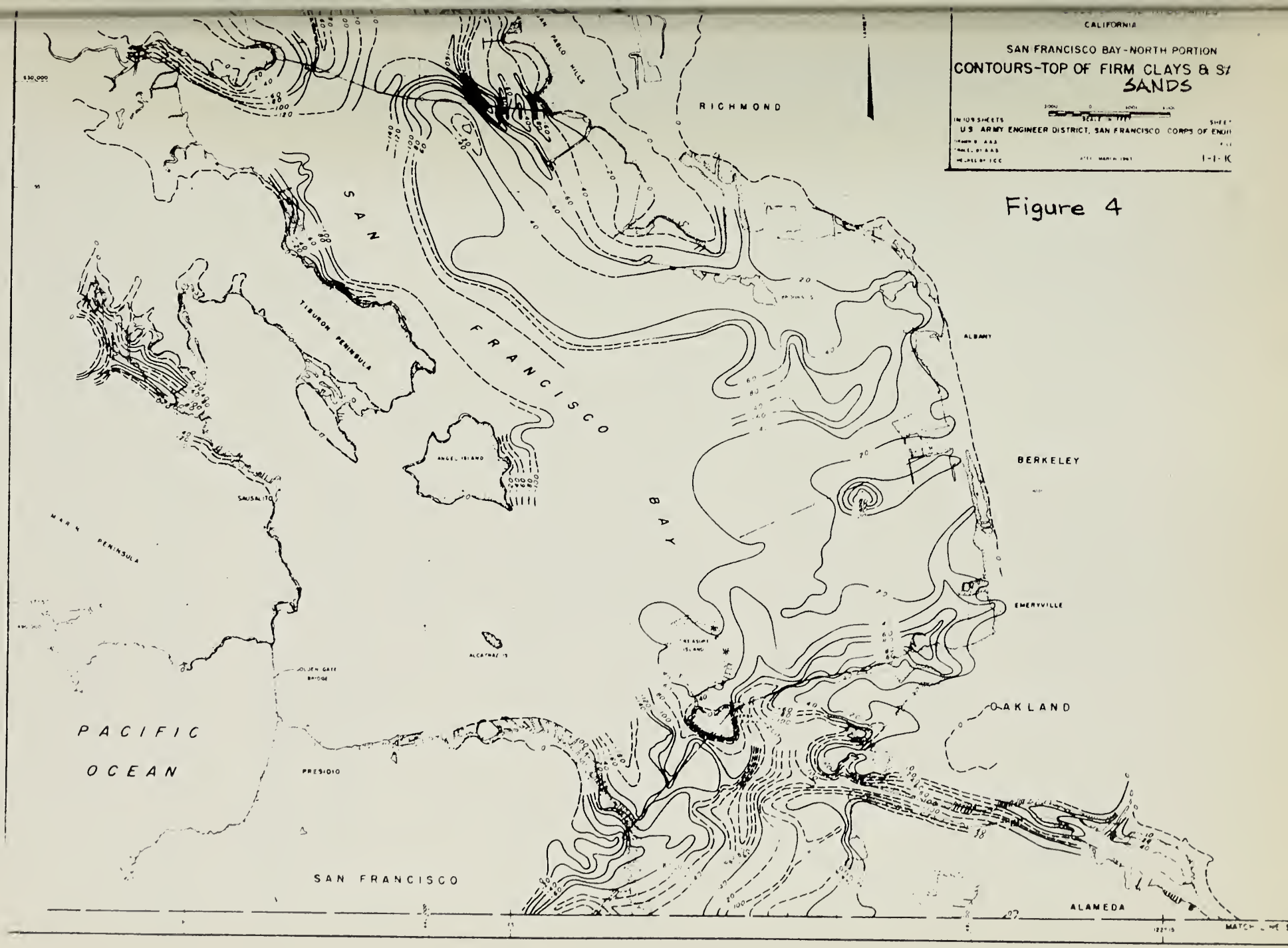

CALIFORNIA
SAN FRANCISCO BAY-NORTH PORTION
CONTOURS-TOP OF FIRM CLAYS & SI
SANDS
U.S. ARMY ENGINEER DISTRICT, SAN FRANCISCO CORPS OF ENGI
1-1-K
RICHMOND
SAN PABLO HILLS
SAN FRANCISCO BAY
TIBURON PENINSULA
ANGEL ISLAND
SAUSALITO
MARIN PENINSULA
ALBANY
BERKELEY
EMERYVILLE
YERBA BUENA ISLAND
ALCATRAZ IS.
GOLDEN GATE BRIDGE
OAKLAND
PACIFIC OCEAN
PRESIDIO
SAN FRANCISCO
ALAMEDA

Figure 4

Bay). The capacity of waters to assimilate organic waste is influenced by many factors, some of the more complex of which are associated with the distribution of the waste material within the receiving waters. The use of dye to simulate waste materials in a hydraulic model of the estuary permits observation of the general waste dispersion patterns which can be expected in the prototype.

The 15 points chosen for dye releases in dispersion tests are indicated on the attached map. The concentration of dispersed dye (which represents pollutants) is expressed in terms of a dispersion factor in parts per billion (ppb) parts of water.

The results of the dispersion tests were indicated on maps by drawing contours of dye concentration. The attached chart indicates the "contours", or dispersion factors, which are found along the Northern Waterfront as a result of waste released from the various dispersal points.

An analysis of this data indicates that water pollution along the Study Area derives from these sources:

1. Most-directly affecting pollution in the area is waste discharged into the Bay from the North Point and Southeast sewage plants in San Francisco. The Southeast plant disperses sewage along the waterfront over more tidal cycles than does the North Point area.

2. Dispersal from Point R, near Richmond, is the third point most directly affecting pollution dispersal along the study area.

3. Other dispersal points with significant affect on pollution along the Northern Waterfront are:

   Point L, near Pinole Point
   Point Q, near Oakland-Alameda
   Point K, near Novato

4. Lesser significance is attached to dispersal points E, F, and G in South San Francisco Bay and points M and N in Suisun Bay.

5. No significance is attached to dispersal points A, B, C, and D in South San Francisco Bay south of the San Mateo-Hayward Bridge.

Therefore, two conclusions are apparent:

1. Water pollution will most directly affect the Northern Waterfront area when it is dispersed from points in North San Francisco Bay and San Pablo Bay.

2. Pollutants dispersed from points in South San Francisco Bay and Suisan Bay will have little or no direct affect on water quality along the Northern Waterfront.

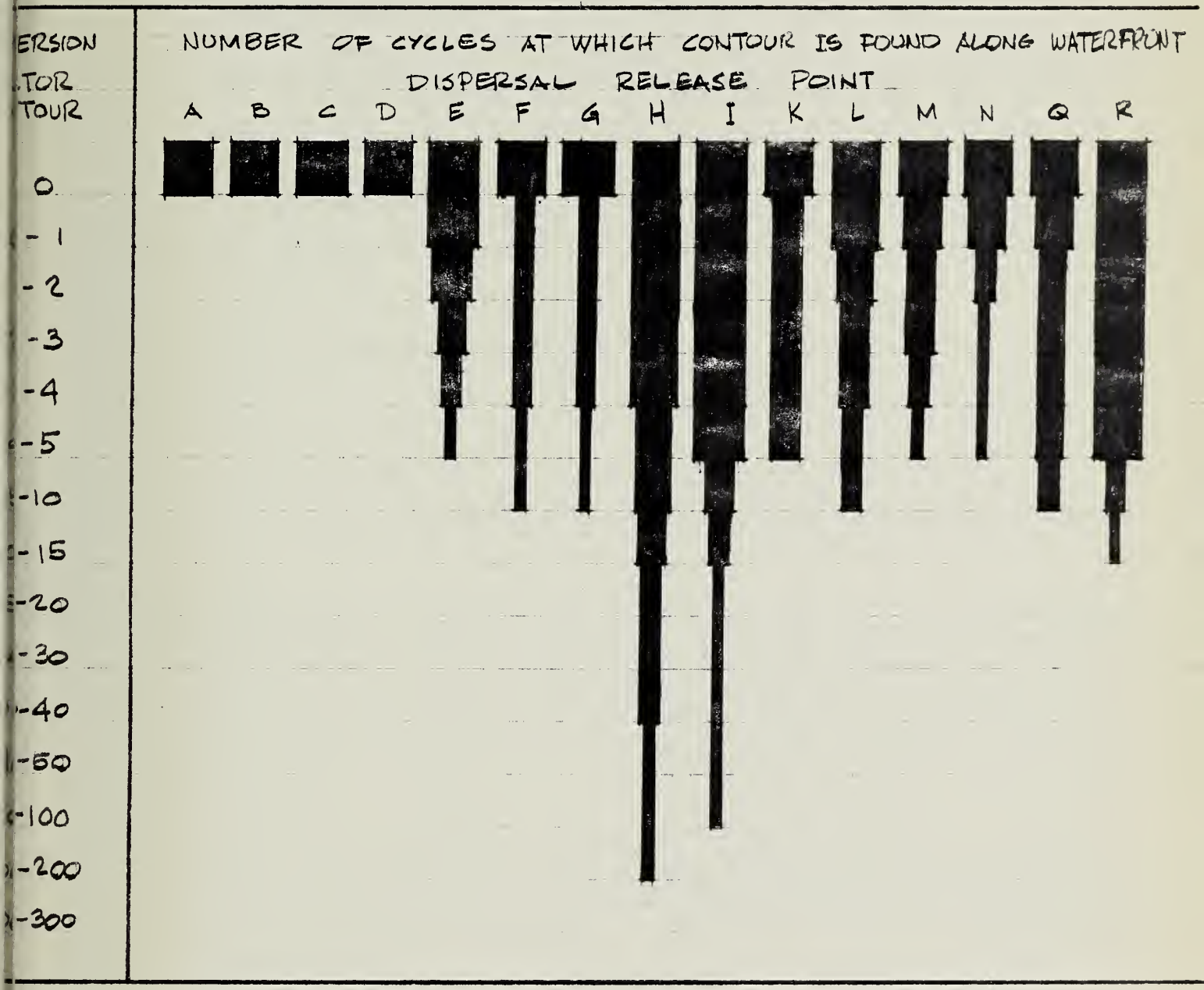
Figure 5

DISPERSION STUDIES LOCATION MAP

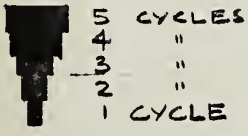
DYE TRACER RELEASE POINTS

Figure 6

POLLUTION DISPERSAL CONTOURS ON THE NORTHERN WATERFRONT



SCALE



VEGETATION

Virtually no natural vegetation is found within the Study Area, although some amounts are found on the steep face of Telegraph Hill and adjacent to the Study Area at Fort Mason. Most of the natural vegetation found in these areas consists of grasses and small shrubs, although a few small trees are also found.

Very little vegetation has been included as part of development in the Northern Waterfront. The grass and trees at the North Point Sewage Treatment Plant at Bay and Grant Streets, however, stand out as notable exceptions.

Suitability of Land for Development

The natural physical characteristics present in the Study Area determine the suitability of land for various kinds of activities. Table 18 generally indicates those uses which are appropriate in relation to different physical characteristics of land.

The capabilities for development of land in the Study Area can be presented in terms of the following four classifications, based upon general relative costs and development problems associated with various physical characteristics.

The accompanying map describes the suitability of land in the area according to the four classes listed in Table 19. All of the Class I land is concentrated in three areas--the base of Telegraph Hill and Russian Hill and on Rincon Hill. Class II land is generally found concentric to Class I land, while Class III land includes all areas from the bases of the hills out to the pierhead line (and includes the majority of land formed from artificial fill). Class IV land is found on the steep slopes of Rincon Hill and Telegraph Hill.

It should also be noted that although development capability is generally indicated in terms of relative cost, the evaluation of alternative plans will include an analysis of estimated costs and benefits, and such analysis will help to determine the actual feasibility of development schemes in relation to development capability.

Table 18

USES APPROPRIATE FOR PHYSICAL CHARACTERISTICS OF LAND

Properties of Land \ Appropriate Uses	Medium-density residential	High-density residential	Commercial	Low-Intensity Industrial	High-Intensity Industrial	Open Space
High bearing strength	X	X	X	X	X	X
Moderate bearing strength	X	X	X	X	X	X
Low bearing strength		X	X	X		X
Bedrock near surface	X	X	X	X	X	X
Bedrock far below surface		X	X	X		X
Good workability	X	X	X	X	X	X
Poor workability		X	X		X	X
High permeability		X	X	X		X
Moderate permeability	X	X	X	X	X	X
Low permeability	X	X	X	X	X	X
Level terrain	X	X	X	X	X	X
Very steep slope		X[1]				X

[1] High-density terraced housing would be most appropriate.

Table 19

CLASSIFICATIONS OF DEVELOPMENT CAPABILITY

CATEGORY	PHYSICAL CHARACTERISTICS	APPROPRIATE USES
Class I (low relative cost of development)	High bearing strength Bedrock near surface Minimum soil of poor workability Low permeability Basically level terrain	Medium- and high-density residential; commercial; low- and high-intensity industrial; open space.
Class II (moderate relative cost of development)	Low-to-moderate bearing strength Bedrock near surface Good workability Moderate-to-high permeability Basically level terrain	Medium- and high-density residential; commercial; low- and high-intensity industrial; open space.
Class III (high relative cost of development)	Low bearing strength Bedrock not near surface Good workability High permeability (and generally high water table) Level terrain	High-density residential; commercial; low-intensity industrial; open space.
Class IV (very high relative cost of development)	High bearing strength Bedrock at surface Poor workability Low permeability Very steep terrain	High-density residential (particularly terraced housing); open space.

URBAN PHYSICAL CHARACTERISTICS

The manner in which the physical form of an urban area is perceived varies depending upon each individual's psychological, physiological and cultural characteristics. The present "State of the Art" is limited--there exists no commonly agreed upon methodology for analysing the urban physical form and the manner in which this phenomenon is perceived.

The main body of the analysis which follows lies within those areas of knowledge which are most advanced in terms of an accepted, tested, and therefore operational methodology. The area of perceptual analysis is that which is least advanced. Pioneering work by Professor Kevin Lynch at M.I.T. set out an approach to such an analysis; that approach emphasized extensive interviews in an effort to describe how people perceive the physical form of a city. However, that approach is fraught with operational difficulties because it raises questions about who should be interviewed and how the interviews should be conducted and interpreted. It also demands on the part of the investigator a specialized knowledge of perceptual psychology and physiology, and it requires substantial amounts of time and expense.

Because of these operational difficulties, unfortunately, this approach has been widely mis-used: i.e., people attempting to apply this approach have adopted its overall framework but have eliminated the key idea that what is important is how the people using an area, not the investigator, perceive and understand it. Thus, by eliminating the interview portion, the results which they obtain do not represent how a group of people perceive the physical environment but rather how a single individual (the investigator) perceives and understands urban physical form.

It was deemed worthwhile, nevertheless, to conduct a generalized, but limited, perceptual analysis which represents our professional evaluation of physical form in the Northern Waterfront area.

HISTORICAL GROWTH OF THE STUDY AREA

Historically, the growth of the waterfront in San Francisco began in 1847 with the extensive construction of piers. This development continued until 1850 when the need for inexpensive land compelled developers to begin filling the bay. To contain the fill, a series of seawalls were constructed between 1866 and 1924.

The accompanying map generally describes the historical development of the waterfront edge. It is significant that the vast majority of the land in the Study Area was created by filling the bay--the only land in the Study Area which is not artificial fill is now found at the bases of Russian, Telegraph, and Rincon Hills. Further, most of the artificial fill was put in place in the approximate period 1847-1869; only relatively small portions of land were created by fill since 1869.

CHARACTERISTICS OF EARLY BUILDINGS

Planning Area I

Until 1964 when Simmons Mattress Company discontinued its operations, this was a manufacturing area. Today very few of the original manufacturing structures remain intact; most have been torn down or remodeled for new purposes. The earliest buildings were brick load-bearing wall structures having notable features such as arched windows and doorways, heavy cornices, and tracery. Because manufacturing spaces required light, the window pattern or fenestration was generally open, uniform and evenly spaced, facilitating conversion for use today as offices, shops, and restaurants. Some examples of converted buildings include Ghirardelli Square, the Cannery, and an office building on Hyde Street between Jefferson and Beach Streets. Some later concrete structures, such as the Simmons Mattress Company building, have been remodeled and are used today as shops and offices in the Northpoint development.

Planning Area II

This area is notable for continued use in its initial capacity as warehouses and print shops. Generally, these original "bulky" buildings are constructed of concrete or brick, some having little or no windows (print shops being an exception). Some conversion has taken place. For example, professional offices, retail furniture stores, and general administrative offices are located in some of the original warehouses.

The "Seawall Warehouse" is an historical landmark which was constructed about 1860-63 and is now used by "Synanon" and a retail shop.

Planning Area III

This area is basically unchanged as a manufacturing-warehouse area. The buildings are generally of concrete or brick construction. The Hills Brothers coffee plant is a notable brick structure distinguished for its Romanesque tracery and clock tower. The Ferry Building, which was built about 1890, is the most notable historical landmark in this area.

GENERALIZED URBAN PHYSICAL FORM WITHIN THE STUDY AREA

PATTERN.

Pattern is the underlying geometry of an urban area. It is formed by the movement systems, buildings, and open space; it is influenced by natural physical characteristics (such as topography and bodies of water) and by the distribution of activities. Two distinct types of pattern are found within the Study Area: the seawall pier pattern and the grid pattern. Market Street is the seam between two different grid patterns. North of

Market Street the blocks and streets form a grid pattern that is oriented approximately north-south, east-west. Here, the overall blocks generally measure 412.5 feet E-W and 275 feet N-S, except in Planning Area II between Bay Street and Broadway Avenue (where the blocks are 275 feet square). South of Market Street the grid pattern is oriented approximately northwest-southeast, and northeast-southwest. These blocks generally measure 550 feet NW-SE, and 825 feet NE-SW.

Some of the notable characteristics of these patterns are:

1. Topography was disregarded and the grid pattern was superimposed over the hills.

2. The Embarcadero follows the approximate line of the seawall. The two grid patterns intersecting the Embarcadero create trapezoidal and triangular blocks.

3. Three distinctly different patterns merge at the intersection of Market Street and the Embarcadero.

4. The curving line of the seawall and the piers located along it form a pattern of finger-piers radiating into the bay.

5. Columbus Avenue bisects the grid pattern north of Market Street, creating a series of triangular blocks.

CHARACTER OF BUILT-UP AND OPEN SPACE AND BUILDING HEIGHT (GRAIN AND TEXTURE)

Grain is determined by the size of development units and parcels; it is usually described as fine or coarse. Texture is determined by the degree of mixture of grain; it is described as even or uneven. Both grain and texture are derived from the character of built-up and open space and building height, which are shown on the accompanying maps and described in Table 20.

Planning Area I

The area between Van Ness and Columbus avenues is generally characterized by a fine grain, even texture due to the predominance of residential structures and clearly-defined open space. The area between Columbus Avenue and the Embarcadero has a coarse grain and uneven texture.

Planning Area II

The Port area with the exception of pier 27 has a fine grain and even texture, but due to the preponderance of tracks and equipment, containers and cargo this area becomes transitional from day to night, weekday to weekend,

and the texture shifts from even to uneven. Inland the area between Bay Street and Broadway is generally fine grained, uneven textured. Telegraph Hill and the open foreground of railroad tracks causes the area to be seen as a compact unit. South of Broadway the area is generally coarse grained, uneven textured.

Planning Area III

Both the Port and the inland side of this area is generally coarse-grained and uneven-textured. The high degree of rail and truck traffic on Port and inland sides again modifies the general character of this area but, in this case, it reinforces the coarse-grained, uneven texture of the buildings and open space.

EDGES AND SEAMS

Edges are the linear elements not used or considered as paths; they act as boundaries and linear breaks in continuity (shores, railroad cuts, edges of development, walls). They are lateral references rather than coordinate axes. Such edges may be barriers, more or less penetrable, which close one region off from another; or they may be lines along which two regions are related and joined together ("seams").

Some important "edges" in the Study Area are the Bay front, Telegraph Hill, Russian Hill, Fort Mason, and the Bay Bridge (an overhead edge). Some important "seams" in the Study Area are Market Street, the Embarcadero, and Columbus Avenue.

BARRIERS

A barrier is either a natural or urban physical element which restricts or obstructs physical movement and/or views and visual linkages. A barrier may also be an edge. For example, the Embarcadero is a seam between two edges--the pier buildings along one side, and the warehouses along the other. The pier buildings act as both physical and visual barriers. In the open space between the pier buildings, the edge of the Bay acts as a physical, but not a visual, barrier. In contrast to this, the Embarcadero Freeway acts as a visual, but not as a physical, barrier. Table 24 lists and describes barriers found in the Study Area.

HIERARCHY OF CHANGE

In urban areas there is generally a hierarchy of change: the underlying geometry ("Pattern") is most resistant to change. The arrangements of the units of development ("texture") is less resistant to change. The size of units of development ("grain") is even less resistant. The other characteristics discussed earlier also exhibit varying degrees of resistance.

ARACTER OF BUILT-UP AND OPEN SPACE

TABLE 20

% OF BUILT-UP & OPEN SPACE		BUILDING HEIGHT (FEET)	
0 - 25	1	- - 40	A
25 - 50	2	41 - 65	B
50 - 75	3	66 - 84	C
75 - 100	4	85 - 135	D
		136 - -	E

TION	PLAN. AREA	ORIENTATION	BULK		OPEN SPACE	GRAIN		TEXTURE		USE OF OPEN SPACE
			BUILD. HEIGHT	BUILT-UP SPACE		COAR	FINE	EVEN	UNEVR	
STREET	I	—	—	—	—					—
CADERO MBUS	|	S	A - B	3	1		/		/	VEGETATION
BUS TO	|	S	A	3	1		/	/		VACANT LOT
TO N	|	S	—	—	4		/		/	VEGETATION - RUSSIAN HILL PARK
N TO ESS	|	S	A	4	1		/	/		
RCADERO UMBUS	|	N	A - B	2	2	/			/	VEGETATION, CONSTRUCTION, PARKING
IBUS TO ESS	↓	N	A	4	1		/	/		
POINT	I	—	—	—	—					—
CADERO UMBUS	|	S	A - B	2	2	/			/	CONSTUCTION PARKING
IBUS K	|	S	A	4	1		/	/		
TO ESS	|	S	6'-WALL	—	4		/	/		PLAYING FIELD
RCADERO UMBUS	|	N	A	2	2	/			/	PARKING, BUSES STORAGE, R.R. SHED
IBUS TO	|	N	A	4	1		/	/		
TO NESS	↓	N	A - E	4	1	/		/		
H	I	—	—	—	—					—
RCADERO UMBUS	|	S	A	2	2	/			/	PARKING, BUSES
IBUS TO	|	S	A - E	4	1	/			/	
RCADERO UMBUS	|	N	A	2	2					R.R. SIDING PARKING
IBUS TO	|	N	A - B	4	1	/		/		
TO	↓	N	—	1	4		/	/		VICTORIAN PARK
RSON	I	—	—	—	—					—
RCADERO DE	|	S	A	2	3	/			/	PARKING
RCADERO	↓	N	A	2	2		/		/	PARKING, BOAT BASIN

ARACTER OF BUILT-UP AND OPEN SPACE

TABLE 20

ION	PLAN. AREA	ORIENTATION	BULK		OPEN SPACE	GRAIN		TEXTURE		USE OF OPEN SPACE
			BUILD. HEIGHT	BUILT-UP SPACE		COAR.	FINE	EVEN	UNEVEN	
ADERO	I									
TO		S	A	3	2	/			/	RR SIDING, PARKING
TO		SW	A	1	3	/			/	RR, STORAGE, PARKING, TRUCKS
R TO		N	A	2	3	/		/		BAY, SHIPING, TRUCKS
I TO	I	NE	A	4	1	/		/		CARGO, SHIPING, TRUCKS
TO NUT	II	E	A	2	2	/		/		CARGO, SHIPING TRUCKS
TO NUT		W	A-C	3	1	/			/	RR, PARKING, STORAGE, TRUCKS
TNUT DWAY		E	A	3	2	/		/		CARGO, SHIPING TRUCKS
NUT DWAY		W	A-C	3	2	/			/	RR, PARKING TRUCKS
WAY NNAN		E	A	4	1	/		/		
WAY ION		W	A-E	2	3	/			/	PARKING, STORAGE
NAN R-46	III	E-SE	A	2	2	/		/		CARGO, SHIPING TRUCKS, PARKING
ON TO IT		SW	A-C	3	1	/			/	RR, TRUCKS PARKING
FT RRY		SW	A-B	2		/			/	RR, TRUCKS PARKING
Y		—	—	—	—					—
RCADERO RD		NW	A	4	1	/			/	PARKING, TRUCKS STORAGE
ERCADERO IRD		SE	A	4	1	/		/		
ND		—	—	—	—					—
I TO M		NE	A-B	3	1	/			/	RR, TRUCKS, PARK., STORAGE
Y TO M		SW	A-B	2	2	/			/	RR, TRUCKS PARK., STORAGE
RD		—	—	—	—					—
N TO NT		NE	A-B	3	1	/		/		PARKING
RY TO NT	III	SW	A-B	3	1					PARKING

LANDMARKS AND AREAS OF SYMBOLIC IMPORTANCE

Landmarks are visual aids to orientation. They are reference points indicating fixed positions within the complex city space. Furthermore, landmarks can have symbolic importance and may denote a city (Golden Gate Bridge), an area, a place, a point of entry, or an exit. Often a single landmark can denote any or all of these qualities depending upon its prominence. A landmark can be either a natural or urban physical element. Depending upon its prominence a landmark can be of primary or secondary importance. Table 21 lists and describes landmarks in the Study Area.

SPATIAL AGGREGATIONS OF ACTIVITIES: ATTRIBUTES AND CHARACTERISTICS

TYPES OF ACTIVITIES

The physical manifestations of the types of activities can produce "grain" (building types, unit size, etc.).

THE DISTRIBUTION OF ACTIVITIES

The physical manifestations of the distribution of activities can produce "pattern". The physical implications are the overall structure or pattern of development.

THE INTENSITY OF ACTIVITIES

The physical manifestations of the intensity of activities is building height and land coverage, or "bulk".

ACTIVITY SYMBIOSIS

Activity symbiosis is the degree of physical interaction or union between activities in a spatial aggregation.

Conditions for Symbiosis

Magnets are the inherent attributes which attract and hold producers of activities, or "generators". Generators are producers of activities which may attract other generators. Linkages are the physical or visual connectors between magnets and generators and/or other generators. Conditions for symbiosis require the presence of generators (but not always magnets). Table 22 lists and describes these elements in the Study Area.

The following list indicates examples of these elements:

Magnets:

Fishing fleet at Fishermans' Wharf

NDMARKS AND AREAS OF SYMBOLIC IMPORTANCE - TABLE 21

PTION	PLAN. AREA	VISUAL PROMINANCE			REFERENCES OR INDICATES					LANDMARK IMPORTANCE	
		FROM AREA	FROM CITY	FROM REGION	DIRECTION	SYMBOLIC	BLDG. OR PLACE	ENTRY-EXIT	AREA	PRIMARY	SECONDARY
ID JDGE	III										
TOWERS	I										
BLDG	II										
RDELLI TOWER	I										
TIME UM	I										
UTINEST. S.-SHIPS	I										
ROMA	I										
RMANS ALL	I										
THIA	I										
ROS. TOWER	III										
AMANS IALL	III										
OIL	III										
-TRAING - TOWER	III										
R BLDG'S	—										
ARCADERO NY	II-III										
VATER IO PARK	I										
		LANDMARKS OUTSIDE OF BUT IMPORTANT TO THE NORTHERN WATERFRONT									
PHHILL	—										
I HILL	—										
WER	—										
ASON											

Generators:

Restaurants at Fishermans Wharf
Motels " " "
Tour Boats " " "
Museums " " "
Shops and Shopping Centers, such as:
Ghirardelli Square
North Point Development
Cost Plus Imports
Places of Recreation (Aquatic Park, Victorian Park)
Ship Terminals

Physical Linkages:

Cable cars
Buses
Ships
Ferry Boats
Private vehicles

Visual Linkages:

Views of magnets and generators within the Study Area, such as:
Fishing fleet at Fishermans Wharf
Ghirardelli, Cost Plus and North Point from Fishermans Wharf
Aquatic Park and Victorian Park from Fishermans Wharf
Ship terminal ´Pier 35 from Fishermans Wharf

Physical Manifestations of Symbiosis

Nodes.

A "node" can be described as a spatial aggregation of activities having a high degree of intensity and symbiosis. Depending on the degree of intensity and symbiosis, a "node" can be characterized as being of primary importance or secondary importance.

Physical Implications of Magnets and Generators.

The physical implications of magnets and generators are the physical facilities and the linkages.

Physical Implications of Physical Linkages.

The physical implications of the physical linkages are the structures and elements of the movement system.

Physical Implications of Visual Linkages.

The physical implications of the visual linkages are the views tieing the magnets and generators together.

PHYSICAL MANIFESTATIONS OF SYMBIOSIS "NODES": TABLE 22

TION	PLAN AREA	GENERAL CATEGORIES OF URBAN ACTIVITIES						CHARACTERISTIC OF NODE		REMARKS
		LIVING	WORKING	SHOPPING	TRAVEL	LEISURE	RECREATION	PRIMARY	SECONDARY	
MANS	I		/				/	/		
DELLI SQ.	I			/					/	
S IMP. S	I			/					/	
POINT	I	UNDER CONST.	/	/					/	
ME M	I								/	
TIME STATE L PARK	I								/	
STATION AL	I				/				/	
BLDG	II		/						/	
0-32 MINAL	III				/				/	

AREAS HAVING A SENSE OF PHYSICAL HOMOGENEITY

Areas having a sense of physical homogeneity will have at least one of the following characteristics:

1. Similar natural physical characteristics, principally topography (Telegraph Hill and Russian Hill) and bay orientation (the Port and Fishermans' Wharf).

2. Similar patterns, grain and texture, including underlying geometry (grid pattern and seawall line) and building bulk and uniformity of massing.

3. Similar building materials and colors; for example, the Port buildings, brick warehouses and manufacturing buildings in Planning Areas I and II.

An urban area which has this pervading homogeneity is a "district". Usually, but not necessarily, a strong district will be a spatial aggregation of similar or compatible activities. Almost all districts are in the process of change; therefore, the physical characteristics and size may also be undergoing a change.

THE MOVEMENT SYSTEM

THE PHYSICAL APPARATUS OF THE MOVEMENT SYSTEM

The physical apparatus of the movement system includes the streets and freeways, parking facilities, pedestrian paths, rail lines and facilities, bus terminals and stops, cable car lines and stops, etc. which serve the Study Area, its districts, and facilities by the various modes. The accompanying map describes the movement system.

POINTS OF MODAL INTERCHANGE

A point of modal interchange is a zone or terminus where a transfer from one mode to another takes place. These are examples of points of modal interchange in the Study Area.

PLANNING AREA I

1. Hyde Street cable car at Victorian Park.
2. Taylor Street cable car at Taylor and Bay Streets.
3. Matson terminal at Pier 35.
4. Tour boats near Pier 45.
5. Omnibus between the ship Balclutha and Ghirardelli Square.

PLANNING AREAS II AND III

1. Ferry boat at Ferry Building.
2. Greyhound Bus at Market Street and the Embarcadero.
3. Muni bus at Mission and Market Streets.
4. P. and O. Lines terminal at Pier 30-32.

POINTS OF ENTRY AND EXIT

Points of entry and exit are those points of transition between the inside or outside of the Study Area and/or its "districts". Points of entry depend largely on the perceptual continuity of the "edge" defining the Study Area, and/or its Districts, which is perceived while moving over a street or sidewalk. The pattern and frequency of intersecting streets, vegetation, and contrast in building "bulk" may by themselves, or in combination, define the point of entry or exit. Depending on the degree of definition of the point of transition, a point of entry or exit may be of primary, or secondary importance. Table 23 lists and describes points of entry and exit in the Study Area.

POINTS OF INTEREST

In terms of the movement system, "points of interest" are the visually-prominent natural and urban physical elements, landmarks, and areas of activities which are perceived while moving along streets or pedestrian paths. Some examples of points of interest are:

Natural physical elements

The hills (Telegraph Hill, Russian Hill, Fort Mason).
San Francisco Bay.
The islands in the Bay (Alcatraz, Angel Island, Treasure and Yurba Buena Islands).

Landmarks

The Bay Bridge, Coit Tower, Ferry Building, Balclutha, cable cars.

Urban Physical Elements

Residences on the hills, Ghirardelli Square, Golden Gateway, port buildings, etc.

Urban Areas of Activities

The fishing boat basin at Fisherman's Wharf, shipping and port activities, Victorian Park and the cable car stop, Aquatic Park, the San Francisco Skyline.

POINTS OF ENTRY AND EXIT

TABLE 23

ETS ION	PLAN. AREA	ELEMENTS WHICH MAY PROVIDE DEFINITION				IMPORTANCE OF ENTRY-EXIT		REMARKS
		BLDG. BULK	EDGE	STREETS	VEGETATION	PRIMARY	SECONDARY	
. AT ESS	I							
AT BUS	I							
T. AT BARCADERO	I							
ST. AT RCADERO	II							
ST. AT	III							THIRD ST. BRIDGE
WAY OFF &	ON RAMPS - INSIDE AND OR OUTSIDE					BUT ADJACENT TO		THE NORTHERN WATERFRONT
RY ST. WAY	I							OFF RAMP
NE ST. DWAY	—							ON RAMP
IGTON VIS	—							OFF RAMP
ST. AT S	—							ON RAMP
ST. AT ON	—							OFF RAMP
ST. AT ON	—							ON RAMP
ST. AT N	—							ON RAMP
ST.	—							OFF RAMP
ONT AT SON ST	III							OFF RAMP
ST. AT SON	III							ON RAMP
ST. AT ON	III							ON RAMP

POINTS OF CONFLICTS OR CONFUSION

In terms of the movement system, points of conflict or confusion generally occur at street intersections. These points are illustrated in the map which describes the movement system.

THE STUDY AREA AS PERCEIVED FROM THE MOVEMENT SYSTEM

Table 23 summarizes physical and visual barriers, landscaping and parking lots, and street characteristics as they are perceived from the movement system.

VIEWS AND VISUAL LINKAGES

In San Francisco a view is an important feature. For example, an increase in rent for the upper stories of high-rise office and apartment buildings is at least partially attributable to the importance of views. A view is a "range and distance of vision"; thus, views can be classified into three groups according to their relative ranges and distances:

Category of View	Relative Range	Relative Distance
Panoramic	great	great
Localized	narrow	great or small
Detailed	narrow	small

The following discussion notes the primary kinds of views found in the Study Area:

Primary Views from Outside to the Inside of the Area

(a) From the bridges and the bay: panoramic views of the skyline and landforms.

(b) From the City: localized views of the waterfront.

Primary Views from Inside to the Outside of the Area

(a) To the bay: panoramic views of the bay, ships and islands on the bay, and the regions beyond.

(b) To the City: panoramic views of the skyline and landforms; localized framed or slotted views up streets (for example, Columbus Avenue and Market Street).

BARRIERS

TABLE 24

PLANNING AREA I & II

F / L / E-T	PHYSICAL BARRIER				VISUAL BARRIER				STREET-GRAIN				LANDSCAPING		PARKING LOT		DESCRIPT. OF BARRIER
	EAST		WEST		EAST		WEST		NORTH		SOUTH						
	NAT	URB	NAT	URB	OPEN	CL	OPEN	CL	COAR.	FINE	COAR.	FINE	LOCATION	ORIENTATION	LOCATION	ORIENTATION	
ROM HYDE		/				/						/	MIDWAY TO MONTGOMERY	N-S	COLUMBUS	N	E-PORT W-HILL
T		/		/		/		/				/	FONTANA TOW. FORT MASON	N W	COLUMBUS TAYLOR POWELL	N-S N-S	E-PORT W-FT.MASON
		/		/		/		/				/	VICTORIAN PK.	N	LEAVENWORTH JONES TAYLOR	N-S N-S	E-PORT W-ST.CL.
ON		/		/		/		/				/	POWELL	N	TAYLOR POWELL	N N	E-PORT W-ST.CL.
—	NORTH		SOUTH		NORTH		SOUTH		EAST		WEST						—
ESS	/				/							/	FORT MASON AQUATIC PARK	W E	VAN NESS	N-S	N-WATER
	/		/		/		/				/						N-M.MUS. S-HILL
N	/		/		/		/				/		NORTH POINT VICTORIAN PARK	E N			N-ST.CL. S-HILL
D	/		/		/		/				/		VICTORIAN PARK	W	JEFFERSON	W	N-PIER S-HILL
N-H	/		/		/		/				/	/			NORTH POINT	E	N-PIER S-HILL
E	/		/		/		/				/	/			BAY NORTH POINT BEACH	E-W E E-W	N-BLDG S-HILL
LR	/		/		/		/				/		BEACH	E	NORTH POINT BEACH EMBARCADERO	E-W E-W E	N-BLDG S-HILL
SN	/		/		/		/				/		NORTH POINT	W	MASON	N	N-WATER N-PIER S-HILL
VILL	/		/		/		/		CONSTRUCT.		/				RR SIDING-BEACH MUNI BUS-N.PT	E E	N-WATER N-PIER 43 S-HILL
SON	/		/		/		/		CONSTRUCT.		/				NORTH POINT	E	N-PIER 45 S-HILL
N	/		/		/		/				—	—			NORTH POINT	E	N-WATER
RY	/		/		/		/				/						N-PIER 39 S-HILL
GOMERY	/		/		/		/				/				FRANCISCO	E	N-PIER 35 S-HILL
HAE	/		-	-	/		/				/				GREENWICH FILBERT	E E	N-PIER 31 S-
TEY	/		-	/	/		/				/		BROADWAY	E	BROADWAY		N-PIER 27 S-FW
RT	/		/		/		/				/				VALLEJO GREEN	E E	N-PIER 23 S-BLDG
N	/		-	-	/		/				/				BROADWAY	E	N-ST.CL S-

Primary Views Within the Area

(a) Localized views: e.g. from the Aquatic Park breakwater to the Victorian Park.

(b) Detailed views: e.g. the fishing boats in the basin at Fishermans Wharf, ship at dock in the port, the Balclutha.

Views may be "visual linkages" -- a view that provides the viewer with some kind of information which by interpreting and using the information allows him to perform some function or operation.

Refer to drawing--Views and Visual Linkages.

SUMMARY

The map entitled "Generalized Urban Physical Form" summarizes the individual characteristics discussed above and thus describes the overall physical form of the Northern Waterfront areas.

SECTION 3: SOCIAL CHARACTERISTICS

The 1960 Census of Population and the San Francisco Community Renewal Study reported upon the social characteristics of the City's population on the basis of census tracts. Because of its particular shape and narrow width, the Northern Waterfront Study Area cuts across a number of census tracts, and no entire tract is included within the Study Area's boundaries. Therefore, this limited analysis of social characteristics of the Northern Waterfront's resident population is based upon data for those census tracts which include portions of the Study Area.

POPULATION CHARACTERISTICS

HOUSEHOLD RELATIONSHIP

The population living east of Columbus Avenue in Planning Area I has about the same proportion of families to total households as does the population of the entire City, while the ratio of families to total households in the area west of Columbus Avenue is about two-thirds of the ratio for the City's population. The ratio of families per 100 households in Planning Area II is far below the ratio for the City. Also, population in the North Beach-Telegraph Hill portion of Planning Area I has a higher proportion of households with six or more persons per unit than do populations in other portions of the Study Area. Thus, the North Beach-Telegraph Hill area population is composed of more families than populations in other parts of the Study Area.

However, the North-Beach-Telegraph Hill area population has a higher rate of families with a single parent than does the City's population or populations living elsewhere in the Study Area, which indicates a higher-than-average ratio of families headed by a widowed, separated, or divorced parent (and which correlates with a higher-than-average incidence of aid-to-dependent-children welfare payments).

RACIAL COMPOSITION

The population of the Study Area has lower proportions of Negro population than does the City as a whole or adjacent areas. However, its proportion of non-white population (not including Negro population) is generally higher than the City-wide average, which basically reflects the number of Chinese people living in the Study Area.

NATIONAL ORIGIN

The population of the Study Area generally includes a smaller proportion of foreign-born persons than does the City-wide population or populations in adjacent area.

AGE

Only the population in the North Beach-Telegraph Hill area includes any large concentration of children under 18 years of age; the populations in other portions of the Study Area all have far smaller proportions of children than the City-wide average. In contrast, the population living east of Columbus Avenue in Planning Area I includes a larger proportion of elderly people than does the total City population, while the population living in other parts of the Study Area has about the same proportion of elderly people as does the total City population.

EDUCATION AND INCOME CHARACTERISTICS

EDUCATION

The educational attainment of the population over 25 years old in the North Beach-Telegraph Hill area is about the same as or very slightly below that of the total City population, while the educational attainment of population living west of Columbus Avenue in Planning Area I is somewhat above the average attainment of the City's population.

INCOME

Family income of the population living west of Columbus Avenue in Planning Area I is generally higher than the average rates for the City; the population in the remainder of the Study Area exhibits generally lower levels of family income and, in fact, over 40 percent of families in the remainder of the Study Area had annual incomes of less than $4,000 in 1959.

HEALTH AND WELFARE CHARACTERISTICS

HEALTH PROBLEMS

The incidence of new tuberculosis cases is one generally-accepted indicator of an area's environmental health. In the Study Area, the rate of new tuberculosis cases is slightly-to-much lower than the rate for the City as a whole.

WELFARE

A lower rate of welfare cases is found west of Columbus Avenue in Planning Area I than in other portions of the Study Area; indeed, other portions of the Study Area generally exhibit higher rates of welfare cases, as measured by the number of recipients of aid to families with dependent children payments and old age assistance payments, than does the City as a whole.

CRIME AND JUVENILE DELINQUENCY

General crime rates in the Study Area are about the same as rates for the entire City, as indicated by total offenses per 1000 population; the incidence of juvenile court cases is generally lower than for the entire City, partly because of a smaller juvenile population in the Study Area.

CHARACTERISTICS OF THE VISITOR POPULATION

The previous discussion deals entirely with the social characteristics of the resident population within the Study Area. Another important "population" consists of both daytime and nighttime visitors to the Study Area, both tourists coming from some distance as well as visitors from the immediate City and metropolitan area.

The visitor population is especially important in the Fisherman's Wharf area. No data is currently available concerning the characteristics of the people who are attracted to this particular area. However, it seems apparent that the types of people attracted to Fisherman's Wharf are not necessarily the same as the types of people attracted to Ghirardelli Square, for example. Further explanation of the characteristics of the visitor population must be made as this study progresses.

PART 4: DEVELOPMENT CHARACTERISTICS

This section describes those characteristics of land in the Northern Waterfront which will affect future development in the area. These characteristics include land ownership patterns, the condition of existing development, land use controls, and public and private development expectations.

LAND OWNERSHIP

The accompanying map describes the locations of land parcels which are publicly-owned. The following table summarizes the characteristics of land ownership within the Northern Waterfront.

Ownership	Area	
	Acres	Percent of Total
Private	189.0	37.7%
Port Authority	151.0*	30.1
City Streets	111.6	22.3
Other City Property	20.8	4.2
State	20.2	4.0
U.S. Government	8.7	1.7
Total	501.3	100.0%

*Includes only land and piers--does not include water areas out to the pierhead line, the actual limit of Port property.

As this summary indicates, somewhat over one-third of the Study Area is privately-owned, the remainder publicly-owned. The largest single landowner is the San Francisco Port Authority, but the City owns nearly as much as the Port.

The ownership map also indicates the location of two major private holdings--the North Point development comprising 6.5 acres near Bay and Stockton streets in Planning Area I, and the North Waterfront Associates property comprising about 22 acres beneath Telegraph Hill in Planning Area II. Some other privately-owned parcels of significant size are owned by railroad companies and food processing firms; most of these parcels are located in Planning Area III.

One further significant pattern of land ownership is found near Fisherman's Wharf, where each of three adjacent blocks are owned entirely by a single concern; these blocks are bounded by North Point and Beach Streets, Stockton and Taylor Streets, and are located between commercial developments at Fisherman's Wharf and the North Point residential-commercial complex.

The San Francisco Community Renewal Program defines maintenance areas and improvement areas within commercial and industrial areas. A maintenance area is one in which 1-8 percent of total floor space is rated in the poorest condition; an improvement area is one in which 9-18 percent of total floor space is rated in the poorest condition. The CRP report indicated that the following portions of the Study Area are considered as maintenance areas:

(a) Planning Area I, east of Leavenworth Street.
(b) Planning Area II, north of Jackson Street.
(c) Planning Area III, between Market and Howard Streets.

The following portions of the Study Area are considered as improvement areas:

(a) Planning Area I, west of Leavenworth Street.
(b) Planning Area II, between Jackson and Market Streets.
(c) Planning Area III, south of Howard Street.

The treatment suggested in the CRP for maintenance and improvement areas under current municipality of [illegible] code enforcement and the provision of minimal improvements as needed.

Residential rehabilitation of Planning Area I has been approved in the CRP for priority action, where clearance and redevelopment is the recommended method of treatment.

Further, more detailed data about building condition in the Study Area is now being collected to supplement the more general data obtained from the above sources.

LAND USE CONTROLS

The two accompanying maps indicate the zoning districts and special height districts which are found in the Study Area.

ZONING DISTRICTS

A majority of the area is zoned for industrial activities, a "carry-over" from previous development patterns. Two areas of commercial zoning are found in Planning Area I -- in the vicinity of Fisherman's Wharf and also in the Ghirardelli Square area. One other commercial zoning area is found in a portion of Planning Area III. Relatively small areas of residential zoning are found in Planning Area I.

SPECIAL HEIGHT DISTRICTS

All development in Planning Area I is limited to a height of 40 feet. This special height limitation was enacted in 1964.

All development in Planning Area II is limited to a height of 84 feet. This special height limitation was enacted in 1946.

No other special height districts are found within the area.

DEVELOPMENT EXPECTATIONS

Many public and private developments in and near the Northern Waterfront are now in construction or advanced planning stages; all such developments will have impacts upon other development in the area and must therefore be co-ordinated with the Northern Waterfront plan. The following discussion points out expected public and private developments.

PUBLIC DEVELOPMENTS

San Francisco Port Authority

Arthur D. Little, Inc., has just completed an intensive study of future Port requirements. This report, which includes a number of recommendations, will serve as a major input for the Northern Waterfront study and plan preparation.

In terms of future development, the most important recommendations contained in the Port study are that, because of changing shipping technology, the Port should relocate a number of pier facilities and in their place develop non-Port commercial activities. It is recommended that the Port Authority release all piers from Pier 37 to Pier 45 at Fisherman's Wharf, and Piers 14-24 between the Ferry Building and the Bay Bridge, but that it is necessary to maintain the areas between Pier 1 (the Ferry Building) and Pier 35, and Pier 26 south to China Basin, as areas of maritime activity.

The study also suggests possible uses which could be included in non-Port developments, and also recommends some realignment of rail facilities in the Northern Waterfront. The following table lists suggested uses for the piers recommended for release. Rail facilities recommended for relocation include the ferry slip at Pier 43, the yard in front of Pier 41, and the quarter-roundhouse.

City and County of San Francisco

Underway at the present time are a number of City development and planning efforts which will influence development in the Northern Waterfront. These include the following:

1. C-3 Zoning Study.
2. Preparation of an updated master trafficways and transit plan.
3. Market Street studies.
4. Ferry Park (Embarcadero Plaza).
5. Golden Gateway Redevelopment Project (residential, office, and commercial).
6. Yerba Buena Redevelopment Project (office, commercial, industrial, and possibly sports arena-convention center).
7. Municipal Railway improvements study and plan.

In addition, the City plans a number of physical improvements of various kinds within the Study Area; these are referenced in the Capital Improvements Program for Fiscal Years 1966-67 to 1971-72, Department of City Planning, July, 1966.

Regional Special Districts and Agencies

Regional special districts and agencies are conducting studies and developing projects which may influence development in the Study Area; these include the following:

1. Bay Area Rapid Transit District (rail rapid transit).
2. Marin County Transit District (Commuter bus transit).
3. Bay Conservation and Development Commission (bay fill policies).

State Agencies

At the present time, the most important State activities in the Study Area focus upon highway transportation. The State Highway Commission has studied freeway connections between the Embarcadero Freeway and the Golden Gate Bridge, and the Division of Bay Toll Crossings is investigating alternative bridge and tube bay crossings to Marin County.

Private Developments

A substantial number of new private developments are either underway or in advanced planning stages at this time; the accompanying map indicates the location and general use of each of these developments. It is estimated that the developments shown on this map will result in an additional residential population of 5,050 people and a net increase in employment of about 35,500 people within or adjacent to the Northern Waterfront.

Table 25

SUGGESTED USES FOR RE-USE OF PORT PIERS

Area	Suggested Uses
Hyde Street Pier	Retail, restaurant, entertainment, hotel.
Fish Alley	Fishing boats, restaurant, retail.
Pier 45	Fish processing, parking, professional office space, retail, art center, restaurants, hotel/motel.
Fisherman's Wharf	No basic change; relocate rail ferry slip.
Pier 41	Oceanarium.
Pier 39	Motel/boatel.
Piers 35, 37	Ship passenger terminal.
(Piers 1-35	Maritime use.)
Ferry Bldg. - Pier 16	Offices, restaurant, retail, heliport.
Piers 18-24	Offices, commercial uses.
(Piers 26 - 46	Maritime use.)

Source: Arthur D. Little, Inc.

SECTION 5: BASIC PROBLEMS AND OPPORTUNITIES

Analysis of the basic data presented in the foregoing sections indicates that certain basic developmental problems and opportunities are found as a result of current conditions in the Northern Waterfront. Although some conditions present both problems and opportunities, the following discussion describes those aspects which can be considered opportunities and other aspects which are considered to be problems. These problems and opportunities are generally indicated on the accompanying map.

OPPORTUNITIES

The following conditions found in the Northern Waterfront can be viewed as presenting developmental opportunities:

MARKET DEMAND AND DEVELOPMENT CYCLE

Analysis of historical development trends and current market demands indicates that the cycle of development in the Northern Waterfront is now in an upward direction. In short, present conditions in the Study Area are such that new investment and physical development is being attracted. This is pointed up by the new private developments which are in planning stages or under construction, particularly in Planning Areas I and II; in fact, a substantial portion of Planning Area II is now being planned for private redevelopment.

PORT DEVELOPMENT

A study by Arthur D. Little, Inc., which has just been completed for the San Francisco Port Authority, indicates two important opportunities:

1. Because of anticipated shipping volumes, the Port will remain a "working" port; thus, the economic value of the Port to the City will remain, as will the Port's contribution to the unique amenity of the Northern Waterfront.

2. However, because of changing shipping technology, a number of existing pier facilities will not be needed in the future and could shortly be released for use by non-port activities; thus, it will be possible for the City to grow to the water's edge and to permit public use of the waterfront.

LAND OWNERSHIP PATTERN

Analysis of land ownership patterns indicates that, together, the Port Authority and the City own somewhat more than 56 percent of all land in the Study Area (this figure would be much higher if one added to it the Port-owned water areas between existing piers and the pierhead line). Thus, public policy will have a great influence upon private development in the Northern Waterfront.

Other land ownership patterns are also significant. For example, about 22 acres of land in Planning Area II is owned by a single firm. Also, each of three large adjacent blocks in the Fisherman's Wharf area are owned entirely by a single concern and one of them is owned by the City (the Kirkland Bus Yard); these blocks are located between commercial developments at Fisherman's Wharf and the North Point residential-commercial complex. These large units of private land offer opportunities for development which are much different than those offered by a number of very small land units.

RESIDENT POPULATION

Although relatively few people live in the Study Area at the present time, a large resident population does live in such nearby areas as Russian Hill, North Beach, Telegraph Hill, and Golden Gateway. Furthermore, additional residential development near Bay and Stockton Streets and at Golden Gateway will increase the size of the population in or adjacent to the Study Area.

Also of importance, especially in the Fisherman's Wharf area, is the tourist population which is attracted to the area by the amenities and commercial and entertainment activities found there.

These resident and tourist populations have certain needs, and they will support those uses and activities which meet those needs.

GENERAL AMENITY OF THE WATERFRONT

The general amenity of the waterfront is a significant opportunity found in the Study Area--it offers a maritime atmosphere, panoramic views of the Bay and the City, and is itself an exciting and interesting place of activity. These amenities, if carefully considered, can do much to enhance the viability of the Northern Waterfront.

PROBLEMS

The following conditions found in the Northern Waterfront are viewed as developmental problems:

PUBLIC COORDINATION REQUIRED

The above discussion indicated that, because they control over one-half of all land in the Study Area, City and Port Authority policy will greatly influence future development. However, cooperation and coordination between the City and the Port Authority will be necessary if desirable physical development in the Northern Waterfront is to be achieved.

DEVELOPMENT POLICY CONFLICTS

Present city development policy emphasizes a compact, centralized major office district. The C-3 Zoning Study estimated that new major office

construction would proceed at a rate of from 400,000 to 800,000 square feet per year.

It was recommended in the Port Study that the Port area between the Ferry Building and the Bay Bridge be developed for office use. However, in view of the C-3 Study estimates and the present pace of office construction, it appears that office development in the Ferry Building area may "compete" with office development in the office core, and if developed might possibly be "borrowing" from the core area.

OPERATIONAL CONFLICTS

It is recommended in the Port Study that two areas be maintained for maritime use--Piers 1-35 and Piers 26-46. At the present time, port requirements for cargo handling and storage conflict with private development opposite port facilities and with traffic flows along the Embarcadero. These operational conflicts must be solved if both the Port and private developments are to function efficiently.

CIRCULATION PROBLEMS

A number of circulation problems which are found in the Northern Waterfront must be solved if desirable physical development is to be achieved. These problems include:

1. The conflict of port cargo-handling traffic and non-port traffic along the Embarcadero.

2. The conflict of pedestrian and vehicular traffic in the Fisherman's Wharf area.

3. The conflict of rail traffic with vehicular traffic and with residential, commercial and entertainment activities.

MAINTENANCE OF AMENITY

The importance of amenities found in the Northern Waterfront is widely recognized. Thus, a primary concern will be the protection of views and the maritime atmosphere and the provision of public open space while at the same time encouraging desirable private development.

SEWAGE TREATMENT PLANT EXPANSION

It is probable that future pollution standards will require that a secondary treatment process be added to the present primary treatment process at the North Point Sewage Treatment Plant. If such a process is added at the present site, a land area equal to that now in use would be required. However, the present site is located at a critical point where level land between the piers and Telegraph Hill is quite narrow, where land values are rising, and where two major thoroughfares intersect (Bay Street and the Embarcadero). Thus, any expansion of the present treatment plant site poses land use, traffic, and economic problems.